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CONGRESSOS

Goldschmidt2016

Yokohama, Japan

June 26th – July 1st, 2016

Call for Session suggestions:
DEADLINE Saturday October 31st

Dear Goldschmidt Delegate,
Goldschmidt2016 will be held in the exciting city of Yokohama, Japan, located an hour by bus from the Tokyo airports and overlooking the beautiful Yokohama bay area. We look forward to welcoming you to the next in this series of prestigious conferences.

The Goldschmidt conference is the most important forum for the discussion of recent results in geochemistry and related fields. The science committee has identified the key theme areas and the whole community is invited to make suggestions for sessions.

Currently there are no sessions listed for any theme, we are asking the community to suggest sessions across the whole of each theme so that the theme chairs can take these building blocks and create a completed session list, filling in any gaps which remain and merging any related or overlapping suggestions into a strong single session.

Any suggested sessions you might propose must be broad enough to attract at least 25 abstract submissions, and the approval of all proposed organisers should be confirmed before your proposal is submitted. Sessions can only be submitted through the website at this address:

<http://goldschmidt.info/2016/sessionSuggestion>

The details you submit will be visible immediately [on the website](#) to the community. We encourage you to submit well in advance of the deadline to establish the areas which are covered and avoid duplication of effort.

If you have any questions about the suitability or overlap of your proposed session with existing sessions, please contact the appropriate theme leaders (whose details are available on the [conference website](#)).

Thank you for playing your part in building this conference for our community.

Best wishes,

Yurimoto Hisayoshi

For the Goldschmidt2016 Science Committee

AMBIENTE BRASIL

11 / 09 / 2015 [Terceiro El Niño mais intenso da história vai durar até 2016](#)

A temperatura em algumas zonas equatoriais do Pacífico em setembro é de 2,1 graus Celsius acima do normal, informou em coletiva de imprensa Mike Halpert, diretor-adjunto da Agência Oceânica e Atmosférica dos Estados Unidos.

11 / 09 / 2015 [Líderes do Pacífico concordam em discordar sobre alterações climáticas](#)

Um encontro de países do sul do Pacífico fracassou em chegar a um entendimento sobre o combate às mudanças climáticas - foi o que informou nesta quinta-feira o presidente de Kiribati, Anote Tong, depois que Austrália e Nova Zelândia, potências regionais, se recusaram a selar um compromisso.

11 / 09 / 2015 [Apesar da chuva, nível do Rio Paraíba continua baixo em Campos, no RJ](#)

Rio está com 4,70 metros, segundo Defesa Civil. Nível baixo é indicativo de risco para seca na região.

11 / 09 / 2015 [Pesca: Brasil e dois vizinhos debatem acordo](#)

Moratória da piracatinga começa a dar resultados. Objetivo é preservar botos e jacarés.

11 / 09 / 2015 [Nova espécie do gênero humano é descoberta na África do Sul](#)

Pesquisadores encontraram ossos de pelo menos 15 homínídeos. Ela foi batizada de 'Homo naledi' e classificada dentro do gênero Homo.

11 / 09 / 2015 [Sistema Cantareira tem 2ª alta seguida](#)

Após 43 dias sem subir, conjunto de represas ganhou volume com chuvas. Todos os reservatórios que abastecem a Grande SP elevaram nível.

11 / 09 / 2015 [Começa nesta sexta-feira a Virada do Cerrado](#)

Mobilização socioambiental chama atenção para o segundo maior bioma brasileiro, com ações em educação ambiental realizadas em todo o DF.

11 / 09 / 2015 [Incêndio força evacuação de reserva para felinos ameaçados nos EUA](#)

Um grande incêndio ativo desde o mês de julho já arrasou mais de 40 mil hectares em Sierra Nevada, próximo do Parque Nacional Kings Canyon, na Califórnia (Estados Unidos).

11 / 09 / 2015 [Cientistas descobrem método para detectar célula de câncer metastático](#)

Implante feito de biomaterial é capaz de capturar células de metástase. Exame em paciente com implante detecta metástase precocemente.

11 / 09 / 2015 [Limpeza de lama que transbordou do rio Tietê em Salto deve durar dois dias](#)

Sujeira é resultado de espuma gerada pelo despejo de esgoto no rio. Primeira parte do 'mutirão' vai liberar avenida, que continua interditada.

11 / 09 / 2015 [Hipertensão, cigarro e obesidade são vilões da saúde global em ranking](#)

Esses três fatores de risco causaram 20 milhões de mortes em 2013. 79 fatores de risco mataram 30 milhões de pessoas em 188 países.

11 / 09 / 2015 [Astrônomos descobrem galáxia anã capaz de formar novas estrelas](#)

Antes, acreditava-se que apenas grandes galáxias formavam estrelas. Descoberta pode ajudar a entender aspectos da formação do universo.

11 / 09 / 2015 [Mont Blanc 'encolhe' 1,3 metro](#)

Montanha mais alta da Europa ocidental registrou 4.808,73 metros de altura. Altitude depende da neve e não era menor que 4.810 metros desde 2005.

11 / 09 / 2015 [Japão determina retirada de 90 mil pessoas devido a inundações](#)

As autoridades japonesas determinaram a retirada de milhares de pessoas de suas casas depois de chuva torrencial, que fez transbordar rios e causou deslizamentos de terra no centro do país.

10 / 09 / 2015 [Estrelas da música cantam contra mudança climática](#)

A música "Love Song to the Earth" (Canção de amor para a Terra) foi divulgada a menos de três meses do início do encontro em Paris, onde de 30 de novembro a 11 de dezembro líderes de todo o mundo tentarão chegar a um acordo para limitar o aumento da temperatura do planeta.

10 / 09 / 2015 [Incêndio na Chapada dos Guimarães está sob controle, diz ICMBio](#)

O Parque Nacional da Chapada dos Guimarães ocupa uma área de 33 mil hectares em Mato Grosso, nos municípios de Cuiabá e Chapada dos Guimarães. O fogo começou no final da tarde de terça-feira (1º), na Morraria do Coxipó do Ouro, entorno do Parque Nacional.

10 / 09 / 2015 [Brasileiros desenvolvem plástico orgânico comestível](#)

Pesquisadores levaram 20 anos para desenvolver produto que consegue se decompor em até três meses.

10 / 09 / 2015 [Brasil fica em 56º em ranking mundial dos melhores países para idosos](#)

Melhor país do mundo para idosos viverem é Suíça, seguido por Noruega. Estudo avaliou o bem-estar social e econômico dos idosos em 96 países.

10 / 09 / 2015 [Equipe internacional finaliza projeto de 'ducha infinita' e filtro d'água impresso em 3D](#)

Os projetos são parte de uma iniciativa que visa o uso sustentável de recursos energéticos.

10 / 09 / 2015 [Parque da Indonésia acha 3 filhotes do rinoceronte mais raro do mundo](#)

10 / 09 / 2015 [Fiocruz vai produzir medicamento para esclerose múltipla](#)

Atualmente importado da Alemanha, o medicamento utilizado para tratar esclerose múltipla – Betainterferona 1ª subcutânea – que tem o nome comercial de Rebif, vai passar a ser produzido no Brasil.

10 / 09 / 2015 [Motorista é flagrado com tartarugas vivas em sacos plásticos em MT](#)

Carro foi parado em barreira policial e na carroceria polícia achou animais. Além das tartarugas, foram apreendidos 22 kg de pescado.

10 / 09 / 2015 [Análise genética desvenda origem da população mais enigmática da Europa](#)

Isolados por milênios em região montanhosa entre França e Espanha, bascos não foram afetados por ondas de migração que mudaram língua e composição genética do resto da Europa.

10 / 09 / 2015 [Cientistas acham possível evidência de transmissão de Alzheimer](#)

Procedimentos médicos poderiam transmitir agente que leva à doença. Não há, porém, evidência de que possa haver transmissão direta.

10 / 09 / 2015 [Ruínas de casa arcaica são encontradas em palácio romano](#)

Segundo os responsáveis pelo trabalho, o achado é impressionante e de valor imensurável devido ao seu ótimo estado de conservação e por ele mudar completamente o mapa da Roma dos séculos VI e V a.C.

10 / 09 / 2015 [Espuma do Rio Tietê que invadiu avenida em Salto/SP vira lama e sujeira](#)

Área próxima ao complexo da cachoeira continua interditada. Fenômeno ocorre por conta da grande poluição despejada no rio.

10 / 09 / 2015 [Cães paraplégicos ganham cadeira de rodas em abrigo no Peru](#)

Animais são recolhidos por peruana e recebem comida e tratamento. Eles ficaram feridos após acidentes ou abuso doméstico.

10 / 09 / 2015 [Seca causa migração e transforma cidade na 'capital das araras' do Brasil](#)

Em Campo Grande (MS), as araras aprenderam a conviver com trânsito intenso, redes de energia, linhas com cerol, poluição sonora e do ar.

10 / 09 / 2015 [Cantareira tem primeira alta em 44 dias após chuva forte em SP](#)

Reservatório teve elevação significativa após temporais de terça-feira (8). Todas as represas que abastecem a Grande SP ganharam volume.

09 / 09 / 2015 [OCDE: países industrializados estão longe do desenvolvimento sustentável](#)

Entre os países mais preparados para cumprir os novos objetivos da ONU estão as nações escandinavas como a Suécia, Noruega, Dinamarca e Finlândia, seguidas da Suíça. Os Estados Unidos, a Grécia, o Chile, a Hungria, Turquia e o México são os que estão em posição pior.

09 / 09 / 2015 [Em Santa Catarina, 19 cidades são atingidas por temporais e granizo](#)

A cidade mais afetada pelo granizo foi Campo Erê, no oeste catarinense. A cidade decretou estado de emergência com aproximadamente 70% do município atingido, segundo a prefeitura.

09 / 09 / 2015 [Parlamento Europeu aprova fim da clonagem com fins comerciais](#)

Projeto de lei em tramitação também proíbe importação de clones, descendentes de clones ou alimentos derivados de organismos clonados.

09 / 09 / 2015 [OCDE elaborará relatório sobre compromissos financeiros da mudança climática](#)

Será uma espécie de recapitulação sobre o caminho percorrido no financiamento dos mecanismos de adaptação e mitigação do aquecimento global desde a cúpula de Copenhague, em 2009, e, sobretudo, terá como objetivo "estabelecer de forma incontestável", os fundos comprometidos pelos poderes públicos, organismos financeiros internacionais e os atores privados.

09 / 09 / 2015 [Zoológico de San Diego comemora os 24 anos da panda Bai Yun](#)

Bolo congelado de frutas e suco de maçã foi devorado em 15 minutos. Mãe de seis filhotes, ela é uma das pandas mais velhas a dar à luz.

09 / 09 / 2015 [Cientista brasileiro cria 'minicérebro' para testar droga contra síndrome](#)

Versão primitiva do órgão simula efeito de síndrome do duplo MECP2.

09 / 09 / 2015 [Promotor pede medidas para evitar acidentes com animais em rodovias](#)

Índice de atropelamento de animais nas rodovias do Centro-Oeste é alto. Associação de Assis recebe animais para tratamento.

09 / 09 / 2015 [Paraná já tem mais de 94 mil pessoas atingidas pela chuva, diz Defesa Civil](#)

Novo boletim foi divulgado no fim da tarde desta terça-feira (8). Cidade com mais estragos é Foz do Iguaçu, com 29 mil atingidos.

09 / 09 / 2015 [Cetáceos de uma mesma espécie usam 'dialetos' diferentes, diz estudo](#)

Cientistas compararam sons emitidos por cachalotes e seu comportamento. Animais usam diferentes 'dialetos' de acordo com grupo a que pertence.

09 / 09 / 2015 [Coleira é capaz de monitorar se animal está com febre ou com dor](#)

Instrumento é capaz de checar temperatura, pulso, respiração e dor. Disponíveis nos EUA, 'coleiras inteligentes' deixam donos mais tranquilos.

09 / 09 / 2015 [Dentista americano que matou leão no Zimbábue volta ao trabalho](#)

Walter Palmer é suspeito da morte, ocorrida em 1º de julho no Zimbábue. Ele foi recebido com protesto e gritos de 'assassino' em consultório.

09 / 09 / 2015 [Três novos casos de ebola são identificados em Serra Leoa](#)

Casos foram registrados em cidade em quarentena após morte de idosa. Todos os doentes eram parte de um grupo considerado de alto risco.

09 / 09 / 2015 [Chuvas podem tirar de situação crítica bacias que abastecem municípios paulistas](#)

O Instituto Nacional de Meteorologia já aponta alerta de acumulado de chuva para 364 municípios do estado. Campinas, Americana e Bragança Paulista estão incluídos. A previsão do Inmet para a semana é de pancadas de chuvas na região abastecida pelas bacias da região.

09 / 09 / 2015 [Peru pode ser país mais afetado no mundo pelo fenômeno El Niño](#)

Governo se prepara para enfrentar um cenário complicado, diz ministro. Previsão é de haja fortes chuvas no norte e seca no sul andino até 2016.

09 / 09 / 2015 [Tempestade de areia mata 2 e deixa 750 hospitalizadas no Líbano](#)

As tempestades de pó e areia são frequentes no Oriente Médio devido as massas de ar que vem do deserto, neste caso do Iraque, que fica ao leste do Líbano.

08 / 09 / 2015 [Taxa de desaparecimento de florestas registra queda desde 1990](#)

Taxa de perda líquida de bosques caiu mais de 50% entre 1990 e 2015. Dados são da FAO, agência da ONU para a Alimentação e a Agricultura.

08 / 09 / 2015 [Estados Unidos acumulam 40% da "dívida ambiental" do mundo, aponta estudo](#)

A análise foi realizada por um grupo de pesquisadores da Universidade Concordia de Montreal, no Canadá, que estimou os débitos climáticos dos países e quanto deveriam pagar pelos danos ambientais causados ao planeta.

08 / 09 / 2015 [Chuva de granizo atinge cidades do oeste do Paraná e causa estragos](#)

Temporal atingiu, pelo menos, oito cidades da região nesta segunda (7). Região sudoeste também registrou estragos com vendaval e granizo.

08 / 09 / 2015 [Viveiro de Nova Odessa/SP reutiliza sacolas plásticas no cultivo de mudas](#)

Medida ambiental proporciona reuso de 100 sacos por mês, diz Prefeitura. Atualmente, plásticos abrigam Otis que serão plantados em vias públicas.

08 / 09 / 2015 [Vírus da pólio ressurgiu no Mali vindo da Guiné, diz OMS](#)

Bebê de colo é o primeiro caso da doença no país em mais de 4 anos. Duas ocorrências foram relatadas na Ucrânia na semana passada.

08 / 09 / 2015 [Novo vírus gigante é descoberto no solo gelado da Sibéria](#)

Com o Mollivirus sibericum, vai para quatro o número de famílias de vírus gigantes identificados desde 2003, incluindo dois já

encontrados no permafrost.

08 / 09 / 2015 [Dentista americano diz que não sabia que leão Cecil fosse tão querido](#)

Walter Palmer é suspeito da morte, ocorrida em 1º de julho no Zimbábue. Animal de 13 anos era atração turística e era pesquisado por cientistas.

08 / 09 / 2015 [Incêndio na Chapada dos Guimarães, em Mato Grosso, chega ao sexto dia](#)

Cem homens trabalham para tentar conter as chamas. Instituto informou que os danos ambientais são enormes.

08 / 09 / 2015 [Maior monumento Neolítico do Reino Unido é encontrado perto de Stonehenge](#)

Os pesquisadores localizaram as grandes e alinhadas pedras, algumas com até cinco metros, em uma construção cinco vezes maior do que Stonehenge, um dos monumentos pré-históricos mais visitados do mundo, a menos de três quilômetros desta construção.

08 / 09 / 2015 [Cientistas desenvolvem teste que revela idade 'real' do corpo](#)

Pesquisadores britânicos comparam atividade de 150 genes para identificar se corpo está envelhecendo bem ou mal; método pode ter vários usos, inclusive em cálculos de seguro de saúde.

08 / 09 / 2015 [Uso de resíduos minerais reduz custo da indústria e ajuda o meio ambiente](#)

Essas inovações tecnológicas, que estão sendo patenteadas no Instituto Nacional da Propriedade Industrial, podem reduzir os custos para as empresas, gerar menor dano para o meio ambiente, e enriquecer o solo, segundo os pesquisadores.

08 / 09 / 2015 [Turistas flagram onça-pintada às margens de rio no Pantanal de MT](#)

No último sábado (5), os visitantes percorreram de barco um rio na região de Porto Jofre e, às margens, viram o felino andando tranquilamente, como se não se importasse com a presença de humanos no local.

08 / 09 / 2015 [Ratos gigantes são treinados para encontrar explosivos no Camboja](#)

Espécie é mais inteligente e tem olfato mais desenvolvido. Roedores podem varrer 200 metros quadrados em menos de 20 minutos.

08 / 09 / 2015 ['Bola de fogo' é registrada sobre o céu de Bangcoc](#)

Explosão de meteoro aconteceu pela manhã na capital da Tailândia e foi registrada por câmera em painel de carro.

07 / 09 / 2015 [França e outros 53 países aceleram o ritmo para cúpula de Paris](#)

A França e outros 53 países iniciaram neste domingo um encontro ministerial de dois dias destinado a impulsionar a organização dos compromissos para cúpula sobre a mudança climática que será realizada em dezembro em Paris, da qual deve sair um acordo para substituir a partir de 2020 o atual Protocolo de Kyoto.

07 / 09 / 2015 [Japão levanta ordem de evacuação em cidade perto de Fukushima](#)

Pesquisa aponta que 53% dos ex-moradores não querem voltar. Naraha fica a 20 km da usina; cerca de 7.400 residentes deixaram a cidade.

07 / 09 / 2015 [Beleza de ipês encanta a população em meses mais quentes do ano no TO](#)

De agosto a meados de outubro, é possível ver a floração das plantas. Calor e tempo seco são condições ideais para flores desabrocharem.

07 / 09 / 2015 [Fred se dissipa no Oceano Atlântico e deixa de ser ciclone tropical](#)

Fred surgiu na bacia atlântica após os resquícios de sua antecessora, Erika, que causou pelo menos 31 mortes e arrasou quase a metade do produto interno bruto de Dominica, onde, assim como em República Dominicana e Haiti, sua presença provocou danos em infraestruturas.

07 / 09 / 2015 [Ave rara, saíra apunhalada atrai turistas estrangeiros ao ES](#)

Interessados em aves geralmente são dos Estados Unidos e da Inglaterra. Pássaro só é encontrado no Espírito Santo, principalmente na região Serrana.

07 / 09 / 2015 [Incêndio em Parque da Chapada é controlado neste domingo](#)

Combate ao fogo foi retomado na madrugada deste domingo (6). Novos focos surgiram à tarde, na região do Rio Paciência.

07 / 09 / 2015 [Palma alimenta gado criado no sertão do Piauí e garante rentabilidade](#)

Com a escassez de água a palma foi alternativa para o gado produzir leite. A planta da família dos cactos se adaptou bem ao clima semiárido brasileiro.

07 / 09 / 2015 [Leão-marinho é encontrado na beira da praia de Xangri-Lá/RS](#)

Imagem gravada por uma turista mostra o animal sobre a areia da praia. BM diz que ele não tem ferimentos e descansa durante a migração.

07 / 09 / 2015 [Em racionamento, Saltinho vai usar cisternas para captar água de chuva](#)

Convênio com governo estadual prevê verba de R\$ 137 mil para projeto. Iniciativa será aplicada em órgãos públicos; cidade chegou a importar água.

07 / 09 / 2015 [ONU lança programa para que planeta fique mais justo e sustentável](#)

Às vésperas do lançamento oficial pelas Nações Unidas dos Objetivos do Desenvolvimento Sustentável, neste mês, a organização quer incentivar pessoas comuns a se comprometerem com as novas metas e a se engajarem voluntariamente.

07 / 09 / 2015 [Sistema Alto Tietê completa 39 dias em queda do volume armazenado](#)

Domingo (6) é o 39º dia de queda consecutiva. Pluviometria acumulada é de 8mm.

07 / 09 / 2015 [Imac e PM apreendem madeira e motosserra em floresta no Acre](#)

Autos de infração foram aplicados pela derrubada de castanheira, diz Imac. Operação ocorreu na floresta do Antimary, na sexta-feira (4) e sábado (5).

31 / 08 / 2015 [Projeto Tamar comemora 35 anos com nova geração de tartarugas](#)

De acordo com dados analisados pelo Projeto Tamar, criado há 35 anos para proteger as espécies que passam pelo Brasil, de 2010 a 2015, houve crescimento de 86,7% no número de filhotes nascidos em relação ao quinquênio anterior.

31 / 08 / 2015 [Biodiversidade: lei é instrumento contra preconceito para povos tradicionais](#)

A Lei da Biodiversidade, apesar de tratar especificamente do patrimônio genético e do conhecimento tradicional associado a esse patrimônio, está servindo de instrumento de luta contra a discriminação para alguns povos e comunidades tradicionais. É o caso dos ciganos e dos povos de terreiro e de matriz africana.

31 / 08 / 2015 [Polícia ambiental flagra extração ilegal de recursos minerais em parque](#)

Ação ocorreu no Parque Estadual do Desengano, em Madalena, no RJ. Equipamentos e objetos utilizados na atividade foram apreendidos.

31 / 08 / 2015 [Depois de um dia de sol, Rio tem noite de sábado com Superlua](#)

Fenômeno deixa Lua 14% maior e 30% mais brilhante, diz cientista. Em 2015 ainda tem Superlua em setembro e em outubro.

31 / 08 / 2015 [Cientista brasileiro vende empresa de biotecnologia por R\\$ 1,5 bilhão](#)

Brasileiro fez doutorado na Universidade de Cornell nos Estados Unidos. Ele fundou empresa que faz kit rápido de diagnóstico bacteriano.

31 / 08 / 2015 [Neurologista e escritor Oliver Sacks morre aos 82 anos](#)

Sacks é o autor do livro "Tempo de despertar" (Awakenings), de 1973, que detalhou sua experiência com pacientes que sofreram de encefalite letárgica e como conseguiam escapar - mesmo que brevemente - de seu estado catatônico com a ajuda de uma medicação.

31 / 08 / 2015 [China quer transferir ou modernizar fábricas após tragédia de Tianjin](#)

Até agora, mais de 140 pessoas morreram em explosão de porto. Temor é de que haja uma contaminação química no país.

31 / 08 / 2015 [Espécie de peixe 'com mãos' pode desaparecer na Austrália](#)

Variedade da Austrália usa nadadeira para 'andar' em vez de nadar. Para evitar extinção, cientistas estudam reprodução em cativeiro.

31 / 08 / 2015 [Artesão eterniza ouriço da castanha em xícaras e porta-trecos, em RO](#)

Apaixonado pela árvore, Nonato quer chamar atenção para preservação. Fabricados na oficina de casa, artesanatos são destaques em Ariquemes.

31 / 08 / 2015 [Equipe da Nasa viverá isolada por um ano para simular vida em Marte](#)

Seis pessoas se mudaram para estrutura perto de um vulcão no Havaí na noite desta sexta-feira; é a mais longa experiência do tipo.

31 / 08 / 2015 [China recupera 620 tartarugas introduzidas ilegalmente no país](#)

A Polícia fronteira da região autônoma de Guangxi (sul) encontrou a carga em 15 caixas escondidas em um caminhão que supostamente transportava mariscos congelados.

31 / 08 / 2015 Tucanos chamam atenção de moradores no Mombaca em Pinda/SP

Segundo um morador, elas começaram a aparecer há cerca de dois meses. Veterinária recomenda evitar aproximação; tucanos são comuns na região.

31 / 08 / 2015 Mudanças climáticas causam alterações no comportamento de beija-flores

Aumento da temperatura diminui a taxa metabólica das aves e faz com que voem menos, aponta estudo.

01 / 09 / 2015 Cientistas descobrem ingrediente que faz sorvete derreter mais devagar

Segundo pesquisadores escoceses, proteína também permitirá que produto seja feito com menos gordura saturada e menos calorias.

01 / 09 / 2015 Cientistas criam droga que 'altera' DNA e inibe evolução do câncer

Grupo da UnB espera liberação de R\$ 170 mil para seguir com estudo. Expectativa é de que medicamento esteja no mercado em 12 anos.

01 / 09 / 2015 Cerca de 90% das aves marinhas têm plástico no organismo, diz estudo

Poluição dos oceanos está colocando em risco as aves marinhas do mundo. Até 2050, 99% dessas aves terão ingerido plástico, diz pesquisa.

01 / 09 / 2015 Cidade de SP tem o agosto mais quente dos últimos dez anos

Com dias de céu azul e muito sol, o mês de agosto foi o mais quente dos últimos dez anos na cidade de São Paulo. A média das temperaturas máximas no mês foi de 26°C.

01 / 09 / 2015 Órbita da ISS é elevada para facilitar acoplamento da Soyuz TMA-18M

A órbita da Estação Espacial Internacional foi elevada nesta segunda-feira a fim de criar condições perfeitas para o acoplamento da nave tripulada russa Soyuz TMA-18M, previsto para o próximo dia 4 de setembro.

01 / 09 / 2015 Temperatura mínima na cidade de São Paulo nunca foi tão alta como em 2015

O dia mais frio de 2015 até o momento foi 27 de junho, quando a temperatura ficou em 10,6°C na capital paulista. Trata-se da mínima mais alta da série histórica.

01 / 09 / 2015 Joinville registra 37,1°C em tarde de altas temperaturas em SC

A segunda (31) também foi marcada pela presença de nevoeiro no litoral. Tempo muda a partir desta terça (1), com chegada de massa de ar frio.

01 / 09 / 2015 Água e educação ambiental terão fórum

Evento busca estratégias na gestão integrada de recursos hídricos.

01 / 09 / 2015 Sanidade animal e vegetal vai reunir representantes de 36 países em Brasília

Na reunião, organizada pelo ministério e pelo Instituto Interamericano de Cooperação para a Agricultura, serão debatidas formas de harmonizar medidas sanitárias e fitossanitárias, com o objetivo de ganhar competitividade no mercado global.

01 / 09 / 2015 Superlua faz maré subir muito e provoca prejuízo em São Luís/MA

Ondas invadiram o cais de Raposa, cidade na área metropolitana de São Luís. Foi a maré mais alta do ano, com quase sete metros de altura.

01 / 09 / 2015 Biodiversidade: povos tradicionais poderão negar acesso a plantas e animais

A Lei da Biodiversidade, sancionada em maio, prevê que comunidades tradicionais, povos indígenas e agricultores familiares possam negar o acesso de pesquisadores e representantes de indústrias ao conhecimento e a elementos da biodiversidade brasileira.

01 / 09 / 2015 Violência contra índios preocupa Anistia Internacional

Em nota divulgada na segunda-feira (31), a entidade destacou que a área Ñanderú Marangatú é uma terra indígena tradicional Guarani e Kaiowá e, além de demarcada, foi homologada em 2005.

01 / 09 / 2015 ONU adverte de que não há dinheiro suficiente para reunião do clima

COP 21 reunirá 195 países de 30 de novembro a 11 de dezembro em Paris. Objetivo é concluir um acordo histórico contra o aquecimento global.

02 / 09 / 2015 Pesquisadores criam tela eletrostática contra mosquitos

Força eletrostática permite maior aderência de inseticida, tornando-as 100% eficazes contra algumas espécies.

02 / 09 / 2015 Após 56 dias sem chuva, termômetro atinge 41 graus no centro de Cuiabá/MT

Altas temperaturas devem continuar na próxima semana, segundo previsão. Tempo seco também deve persistir na capital, sem chuva há mais 50 dias.

02 / 09 / 2015 Estudo desvenda como veneno de vespa brasileira mata célula de câncer

Toxina leva à formação de 'buracos' na membrana de células cancerígenas. Mecanismo pode levar ao desenvolvimento de novas drogas contra câncer.

02 / 09 / 2015 Arara 'adotada' por comunidade ganha sorvete em São Sebastião/SP

Animal passeia pelo bairro São Francisco e região há cerca de um ano. Moradora diz que animal brinca com as crianças durante intervalo na escola.

GSW JOURNAL

TAPHONOMY OF A MONODOMINANT CENTROSOURUS APERTUS (DINOSAURIA: CERATOPSIA)
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<http://palaíos.sepmonline.org/cgi/content/abstract/30/9/655?source=gsww>

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Canadian Journal of Earth Sciences. 2015; 52(9): p. 776-794

<http://cjes.geoscienceworld.org/cgi/content/abstract/52/9/776?source=gsww>

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<http://srl.geoscienceworld.org/cgi/content/full/86/5/1374?source=gsww>

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Shimai Shangguan, Ingrid Ukstins Peate, Wei Tian, and Yigang Xu

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10.1144/jgs2014-136

<http://jgs.lyellcollection.org/cgi/content/abstract/jgs2014-136v1?source=gsw>

Assessing the impact of orogenic inheritance on the architecture, timing and magmatic budget of the North Atlantic rift system: a mapping approach

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Journal of the Geological Society published 9 September 2015,

10.1144/jgs2014-139

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Bulletin of the Seismological Society of America published 8 September

2015, 10.1785/0120150099

<http://www.bssaonline.org/cgi/content/abstract/0120150099v1?source=gsw>

Shallow S-Wave Well Logs as an Indicator of Past Strong Shaking from Earthquakes on the Newport-Inglewood Fault

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Bulletin of the Seismological Society of America published 8 September

2015, 10.1785/0120150026

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2015, 10.1785/0120150046

<http://www.bssaonline.org/cgi/content/abstract/0120150046v1?source=gsw>

Deep-Water Sediment Bypass

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2015, 10.1785/0120140311

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2015, 10.1785/0120150098

<http://www.bssaonline.org/cgi/content/abstract/0120150098v1?source=gsw>

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 2015, 10.1785/0120140359
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- Faulting Style Controls for the Space-Time Aftershock Patterns
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 2015, 10.1785/0120140336
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 2015, 10.1785/0120150032
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 2015, 10.1785/0120150119
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<http://aapgbull.geoscienceworld.org/cgi/content/abstract/99/9/1671?source=gsw>
- AAPG Bulletin
 September 2015; 99 (9)

<http://aapgbull.geoscienceworld.org/content/99/9?etoc>

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Depositional processes and impact on reservoir quality in deepwater Paleogene reservoirs, US Gulf of Mexico
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<http://aapgbull.geoscienceworld.org/content/99/9/1745.abstract?etoc>

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doi:10.1306/03031514119

<http://aapgbull.geoscienceworld.org/content/99/9/1771.abstract?etoc>

EARTH GAUGE

Earth Gauge is taking a short break over the Labor Day holiday. The regular weekly email will return next week. In the meantime, we hope you will check out these weather preparedness resources from NOAA and FEMA:

☐ [Get Ready for Fall Hazards](#): Access articles, social media plans, graphics, presentations and web content on fall weather hazards, including El Niño, hurricanes, space weather, wildfires, winter weather, floods, winds and drought.

☐ [National Preparedness Month](#): Access information about National Preparedness Month weekly themes, public service announcements and videos, a digital engagement toolkit and social media resources.

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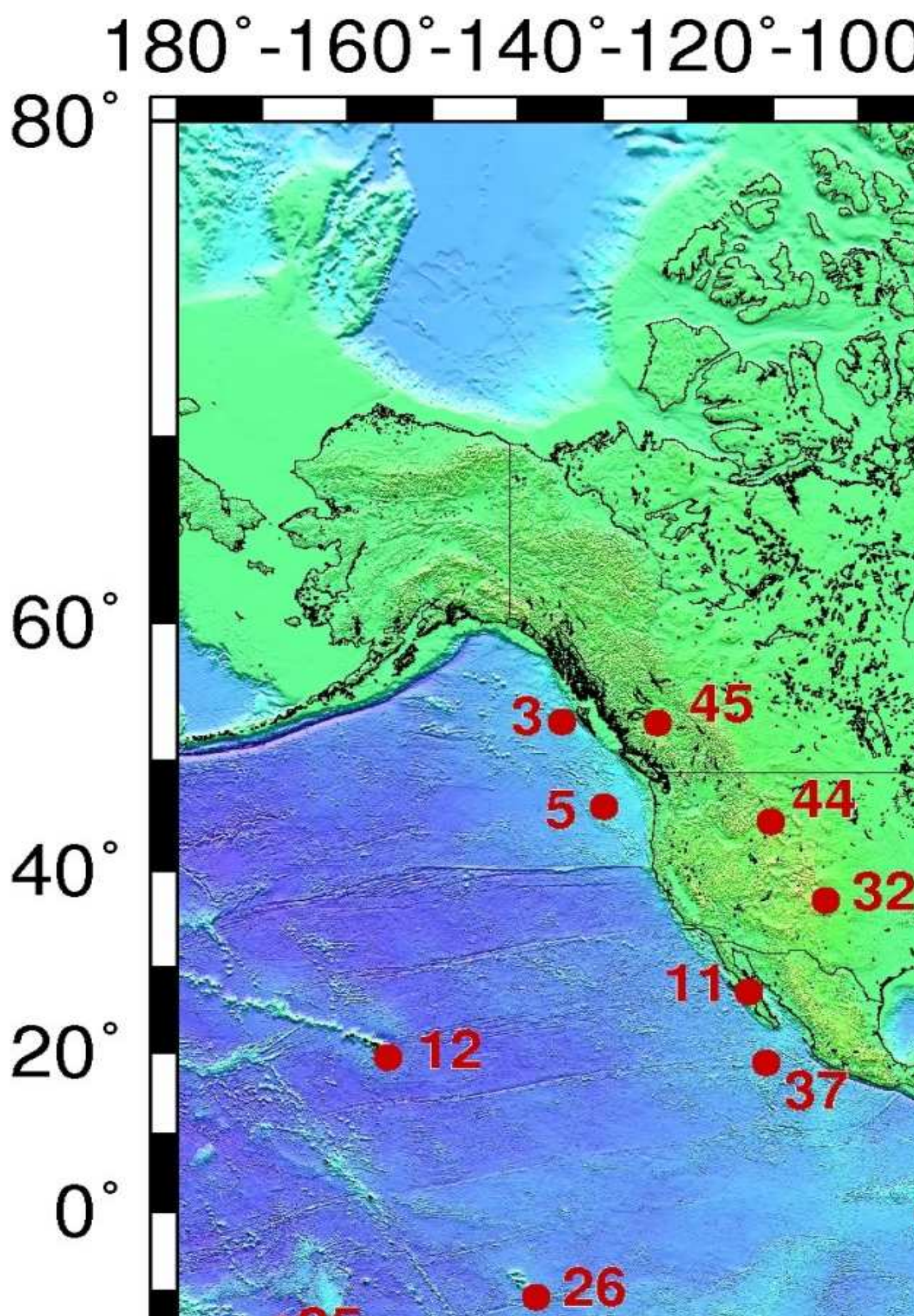
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EARTH PAGES

[Hotspots and plumes](#)

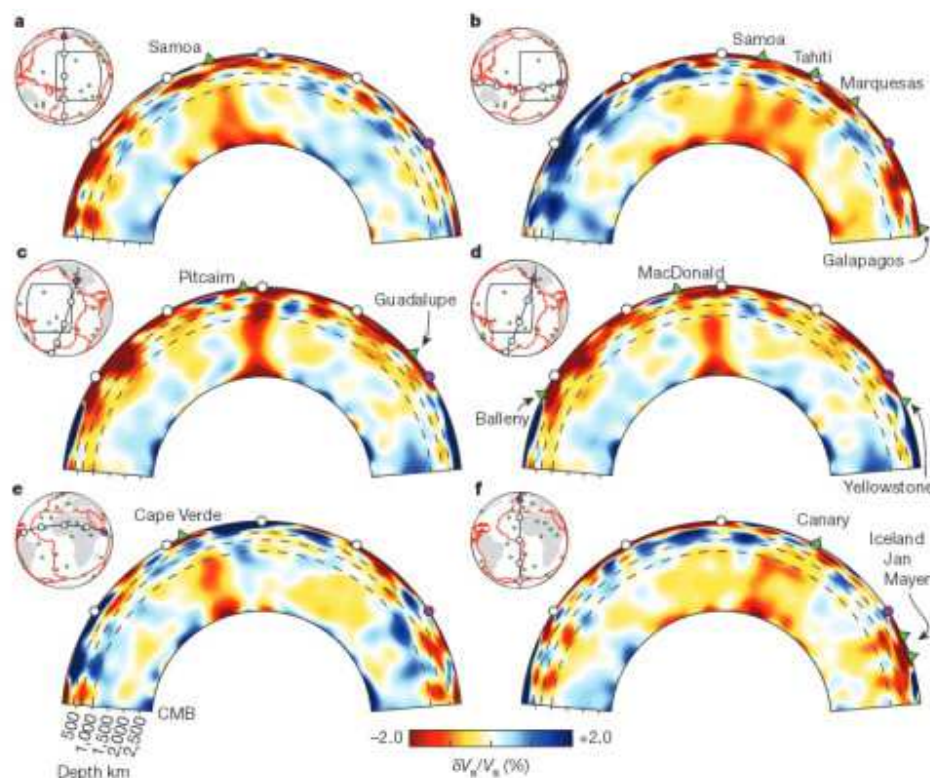
Posted on [September 7, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

One of the pioneers of plate tectonics, [W. Jason Morgan](#), recognised in the 1970s that chains of volcanic islands and seamounts that rise from the ocean floor may have formed as the movement of [lithospheric plates](#) passed over sources of magma that lay in the mantle beneath the plates. He suggested that such [hotspots](#) were fixed relative to plate movements at the surface and likened the formation of chains such as that to the west of the volcanically active of the Hawaiian ‘Big Island’ to linear scorching of a sheet of paper moved over a candle flame. If true, it should be possible to use hotspots as a framework for the [absolute motion of lithospheric plates](#) rather than the velocities of individual plates relative to the others. But Morgan’s hypothesis has been debated ever since he formulated it. A test would be to see whether or not plumes of rising hot material in the deep part of the mantle can be detected. This became one of the first objectives of seismic tomography when it was devised in the last decade of the 20th century: a method that uses global earthquakes records to detect parts of the mantle where seismic waves traveled faster or slower than the norm: effectively patches of hot (probably rising) and cold rock. The first such evidence was equally [hotly debated](#), one view being that the magma sources beneath oceanic islands such as Hawaii and Iceland were actually related to plate tectonics and that the hotspot hypothesis had become a kind of belief system.



Global distribution of hotspots (credit: Wikipedia)

The problem was that [mantle plumes](#) supposedly linked to magmatic hotspots in the upper mantle would be so thin that they would be difficult to detect even with seismic tomography. Geophysicists have been trying to sharpen up seismic resolution partly by using supercomputers to analyse more and more seismic records and also by improving the theory about how seismic waves interact with 3-D mantle structure. This has culminated in more believable visualisation of mantle structure (French, S.W. & Romanowicz, B. 2015. Broad plumes rotted at the base of the [Earth's mantle](#) beneath major hotspots). The two researchers from the University of California at Berkeley in fact showed something different, but still robust support for Morgan's 40-year old ideas. Instead of thin plumes, they have been able to show much broader conduits beneath at least 5 and maybe more active ends of hotspot chains. The zones extend upwards from the [core-mantle boundary](#) to about 1000 km below the Earth's surface, where some bend sideways towards hotspots, perhaps as a result of another kind of upper mantle circulation.



Whole-Earth seismic tomography cross sections beneath a variety of volcanic islands, (Credit French and Romanowicz; <http://www.nature.com/doi/10.1038/nature14876>)

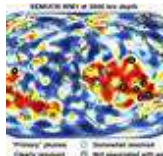
The sources of these hot columns at the core-mantle boundary appear to be zones of very low shear-wave velocities; i.e. almost, but not quite molten blobs. French and Romanowicz suggest that the columns are extremely long-lived and may even have a chemical dimension – as in the hypothesis of [mantle heterogeneity](#). Another interesting feature of their results is that the striking vertical linearity of the columns could indicate that the overall motion of the lower mantle is extremely sluggish and punctured by discrete convection.

Related articles

[A Plume, a Blob, a Volcano](#)



[Mapping hot deep columns of molten rock in the top 3000km thick layer](#)



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Thin- or thick-skinned tectonics: a test

Posted on [August 24, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

How the continental lithosphere deforms at [convergent plate margins](#) has been a matter of opinion that depends on where observations have been made in ancient orogenic belts. One view is that arc and collisional orogens are dominated by deformation of the upper crust and especially the cover of sedimentary and volcanic rocks above deeper and older basement. This is a 'thin-skinned' model in which rocks of the upper crust are detached from those below and thicken more or less independently by [thrust faulting](#), the formation of ductile nappes or a combination of the two. Mountain ranges, in this view, are the product of piling up of thrust slices or nappes, as exemplified by the Alps, Canadian Rockies and the Caledonian thrust belt of NW Scotland. Thick-skinned processes, as the name suggests, see crustal shortening and thickening as being distributed through the crust from top to bottom and even involving the lithospheric mantle. The hinterlands of both the Alps and the Scottish Caledonides show plenty of evidence for entire-crust deformation, deep crustal rocks being found sheared together with deformed rocks of the cover. It stands to reason that orogenic processes on the grand scale must involve a bit of both.

Both hypotheses stem from field work in deeply eroded, structurally complex segments of the ancient crust, and it is rarely if ever possible to say whether both operated together or one followed the other during the often lengthy periods taken by orogeny to reach completion, and the sheer scale of the process. [Orogenesis](#) is going on today, to which major seismic activity obviously bears witness. But erosion has not progress from cover through basement so, up to now, only seismicity and geodetic GPS measurements have been available to show that continental crust in general is being shortened and thickened, as well as being moved about. Potentially, a means of assessing active deformation, even in the deep crust, is to see whether or not the speeds of seismic waves at different depths are biased depending on their direction of travel. Such anisotropy would develop if the mineral grains making up rocks were deformed and rotated to preferred directions; a feature typical of metamorphic rocks. But to make such measurements on the scale of active orogens requires a dense network of seismometers and software that can tease directionality and depth out of the earthquake motions detected by it.



Aligned minerals in a Brazilian metamorphic rock (credit: Eurico Zimbres in Wikipedia)

A joint Taiwanese-American consortium set up such a network in Taiwan, which is capable of this type of seismic tomography. Taiwan is currently taking up a strain rate of 8.2 cm per year due to motion of the Philippine Plate on whose western flank the island lies: it is part of an island arc currently colliding with the stationary [Eurasian Plate](#) and whose crust is shortening. Results of seismic anisotropy (Huang, T.-Y. *et al.* 2015. Layered deformation in the Taiwan orogen. *Science*, v. **349**, p. 720-723) show that the fast direction of shear (S) waves changes abruptly at about 10 to 15 km deep in the crust. In the upper crust this lines up with the roughly N-S structural 'grain' of the orogen. At between 13 to 17 km down there is no discernible anisotropy, below which it changes to parallel the direction of plate motion, ESE-WNW. It seems that thin skinned tectonics is indeed taking place, although probably not above a structural detachment. Simultaneously the deep crust is being deformed but the shearing is ascribed to the descent of lithospheric mantle of the Philippine Plate beneath the Eurasian Plate, while the deep crust remains attached to the upper crust. If it were possible to examine the mineral lineations now forming in both the Taiwanese upper and lower crust where metamorphism is active, then the two directions would be apparent. Although not mentioned by the authors, perhaps the detection of different directionality of aligned [metamorphic minerals](#) in low- and high-grade metamorphic rocks might indicate such tectonic processes in the past.

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Roman concrete restrains magma

Posted on [August 17, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

Four million people in and around the Italian city of Naples on the shore of the Tyrrhenian Sea have always lived under a double threat of natural disaster. The one that immediately springs to most people's mind is the huge volcano [Vesuvius](#) that looms over its eastern suburbs, for this was the source of the incandescent pyroclastic flow that overwhelmed Pompeii and Herculaneum in 79 CE. Less familiar outside Italy is a cluster of elliptical volcanic features directly to the west of the city: Campi Flegrei or the [Phlegraean Fields](#). In fact the cluster is part of a vast, dormant caldera, half of which lies beneath the sea centred on the ancient Roman port of [Puteoli](#) (modern Pozzuoli). This volcanic collapse structure is about 10 km across; about as large as Vesuvius. Campi Flegrei is famous for its sulfur-rich

fumaroles including the mythical crater home of Vulcan the god of fire, Solfatara.



The [Bay of Naples](#) with Vesuvius to the east of the city and Campi Flegrei to the west. (credit: Google Earth)

Between 1970 and 1984 the ground around Pozzuoli rose more than 2 metres, which may be evidence that the deep seated magma chamber is inflating. Fears that this might presage an eruption in the near future stems from a curious feature affecting archaeological remains, such as upright pillars in the harbour area of Pozzuoli. At many different levels the stonework is pockmarked by curious holes that are the fossil borings of marine molluscs: at some stage the feet of the pillars descended below sea level. Together with historic records since the Roman era these borings help to establish the local ups and downs of the surface over the last two millennia in considerable detail. From a high of 4 m above sea level when the pillars were erected 194 BCE they slowly subsided to reach sea level around 300 CE when Puteoli ceased to be an important harbour and 4 metres below that around 900 CE. For the last millennium they have slowly risen until in 1538 more than 4 metres of inflation took place very rapidly. That was immediately followed by a small eruption of about 0.02 km³ of magma at Mount Nuovo, to the northeast of another recent crater now occupied by a lake: hence the fear surrounding the uplift in 1970-84. Campi Flegrei has a history of eruptions going back 40 thousand years, including two in the 'super volcano' category of 200 and 40 km³ that blanketed vast areas in pyroclastic ash.

One tantalising aspect of the ground inflation and deflation is that each cycle lasts of the order of a thousand years. Another seems to be that magma breaks to the surface very rapidly after a long period of inflation, as if whatever was keeping the magma chamber in a metastable state failed in a brittle fashion. Tiziana Vanorio and Waruntorn Kanitpanyacharoen of Stanford and Chulalongkorn universities in the US and Thailand have come up with a possible reason for such gradual crustal warping in volcanic areas and long-delayed eruption, for which Campi Flegrei is a model case (in fact the oscillations there are unsurpassed). Such long-term bending of the crust suggests abnormally strong rock near the surface. The co-workers analysed borehole cores that penetrated to the depth of small shallow earthquakes – in the metamorphic basement of the area – and found that the zone above the seismically active layer is not only stronger than the basement, but closely resembles a construction material to which Roman architecture owes its longevity (Vanorio, T. & Kanitpanyacharoen, W. 2015. Rock physics of fibrous rocks akin to [Roman concrete](#) explains uplifts at Campi Flegrei Caldera. *Science*, v. **349**, p. 617-621).



Mollusc-bored pillars in the Macellum (indoor market) of Pozzuoli (credit: Wikipedia)

Roman masons discovered that by mixing young, loose volcanic ash with lime mortar (calcium hydroxide) produced a strong concrete when cured. Specifically, the invention of concrete took place at Pozzuoli itself, using volcanic ash from Campi Flegrei and the product

was known as pozzolana. Young ash from an explosive volcano is mainly shards of anhydrous silicate glass, which quickly react with water and calcium hydroxide to produce fibres of hydrous calc-silicate minerals, almost as in conventional cement curing, but without the need for heating limestone and clay to very high temperatures. The strength of pozzolano enabled Roman architects to build the great dome of the [Pantheon](#) in Rome, still the world's largest unreinforced concrete dome. Moreover, the speed with which it sets by exothermic reactions enables its use below sea level. Vanorio and Kanitpanyacharoen found that the strong upper zone beneath Campi Flegrei is almost identical to pozzolano, and suggest that it formed as a result of calcium-rich hydrothermal fluids percolating through young pyroclastic rocks. The calcium derives from metamorphic basement rich in calc-silicate layers through which hot groundwater is driven as a result of heat from the underlying magma chamber. It seems the Campi Flegrei caldera has built its own containing dome. But that is perhaps a mixed blessing: the 1970-84 inflation seems now to be deflating and the flexible carapace may make using ground movements as means of predicting eruptions unreliable.



Interior view of the dome of the Pantheon in Rome (credit: Wikipedia)

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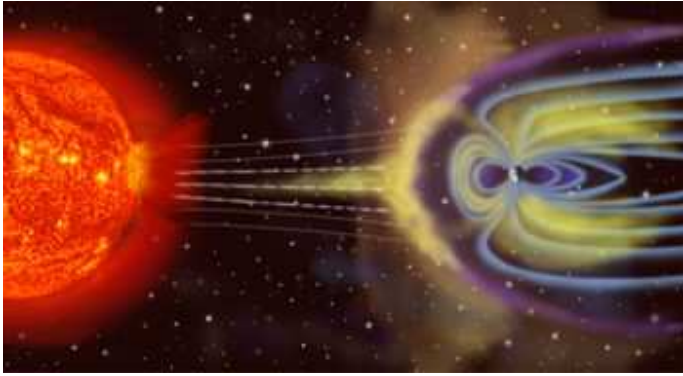
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[When Earth got its magnetic field](#)

Posted on [August 13, 2015](#) by [Steve Drury](#) | [1 comment](#)

For a planet to produce life it needs various attributes. Exoplanet hunters tend to focus on the 'Goldilocks' Zone' where solar heating is neither so extreme nor so little that liquid water is unstable on a planet's surface. It also needs an atmosphere that *retains* water. Ultraviolet radiation emitted by a planet's star dissociates water vapour to hydrogen and oxygen and the hydrogen escapes to space. The reason Earth has not lost water in this way is that little water vapour reaches the stratosphere because it is condensed or frozen out of the air as the lower atmosphere becomes cooler with altitude. Given moist conditions survivability to the extent that exists on Earth still needs another planetary parameter: the charged particles emitted as an interplanetary 'wind' by stars must not reach the surface. If they did, their potential to break complex molecules would hinder life's formation or wipe it out if it ventured onto land. A moving current of electrical charge, which is what a stellar 'wind' amounts to, can be deflected by a magnetic field. This is what happens on Earth, whose magnetic field is a good reason why our planet has supported life and its continual evolution since at least about 3.5 billion years ago.



Deflection of the solar 'wind' by Earth's magnetosphere. (credit: Wikipedia)

Direct proof of the existence of a [geomagnetic field](#) is the presence of aligned particles of magnetic minerals in rocks, for instance in a lava flow, caused by their acquiring magnetisation in a prevailing magnetic field once they cooled sufficiently. The earliest such *remanent* magnetism was found in igneous rocks from north-eastern South Africa dated at between 3.2 to 3.45 billion years. All older rocks do not show such a feature dating back to their formation because of thermal metamorphism that resets any remanent magnetism to match the geomagnetic field prevailing at the time of reheating. There are, however, materials that formed further back in time and are also known to resist thermal resetting of any alignments of magnetic inclusion. They are zircons (ZrSiO_4), originally crystallised from igneous magmas, which may have locked in minute magnetic inclusions. Zircons are among the most change-resistant materials and they can also be dated with great precision, with the advantage that the U-Pb method used can distinguish between age of formation and that of any later heating. Famously, individual grains of zircon that had accumulated in an early Archaean conglomerate outcropping in the [Jack Hills](#) of Western Australia yielded [ages going back from 3.2 to 4.4 billion](#) years; far beyond the age of any tangible rock and close to the formation age of the Earth. Quite a target for palaeomagnetic investigations once a suitable technique had been developed.



Western Australia's Jack Hills from Landsat (credit NASA Earth Observatory)

John Tarduno and colleagues from the Universities of Rochester and California USA and the Geological Survey of Canada report the magnetic properties of the Jack Hills zircons (Tarduno, J.A. *et al.* 2015. A Hadean to [Paleoarchean](#) geodynamo recorded by single zircon crystals. *Science*, v. **349**, p. 521-524). All of the grains analysed record magnetisation spanning the period 3.2 to 4.2 billion years that indicate geomagnetic field strengths ranging from that found today at the Equator to about an eighth of the modern value. So from 4.2 Ga onwards geomagnetism probably deflected the solar wind: the early Earth was set for living processes from its earliest days. The discovery also supports the likelihood of functioning plate tectonics during the Hadean.

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Pleistocene megafaunal extinctions – were humans to blame?

Posted on [August 4, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

Australia and the Americas had an extremely diverse fauna of large beasts (giant wombats and kangaroos in Australia; elephants, bears, big cats, camelids, ground sloths etc in the Americas) until the last glaciation and the warming period that led into the Holocene interglacial. The majority of these megafauna species vanished suddenly during that recent period. To a lesser extent something similar happened in Eurasia, but nothing significant in Africa. Because the last glacial cycle also saw migration of efficient human hunter-gatherers to every other continent except Antarctica, many ecologists, palaeontologists and anthropologists saw a direct link between human predation and the mass extinction (see *Earth-Pages* of [April 2012](#)). Earlier humans had indeed spread far and wide in Eurasia before, and the crude hypothesis that the last arrivals in Australasia and the Americas devoured all the meatiest prey in three continents had some traction as a result: predation in Eurasia and Africa by earlier hominids would have made surviving prey congenitally wary of bipeds with spears. In Australia and the Americas the megafauna species would have been naive and confident in their sheer bulk, numbers, speed and, in some cases, ferocity. Other possibilities emerged, such as the [introduction of viruses](#) to which faunas had no immunity or as a result of climate change, but none of the three possibilities has gained incontrovertible proof. But the most popular, human connection has had severe knocks in the last couple of years. A fourth, that the extinctions stemmed from a [comet impact](#) proved to have little traction.



Megafauna in a late-Pleistocene landscape including woolly mammoths and rhinoceroses, horses, and cave lions with a carcass. (credit: Wikipedia)

Since the amazing success of analysing the bulk DNA debris in sea water – environmental DNA or eDNA – to look at the local diversity of marine animals, the analytical and computing techniques that made it possible have been turned to ancient terrestrial materials: soils, permafrost and glacial ice. One of the [first attempts](#) revealed [mammoth](#) and pre-Columbian horse DNA surviving in Alaskan permafrost, thanks to the herds' copious urination and dung spreading. Several articles in the 24 July 2015 issue of *Science* review [ancient DNA](#) advances, including eDNA from soils that chart changes in both fauna and flora over the last glacial cycle (Pennisi, E. 2015. Lost worlds found. *Science*, v. **349**, p. 367-369). Combined with a variety of means of dating the material that yield the ancient eDNA, an interesting picture is emerging. The soil and permafrost samples potentially express ancient ecosystems in far more detail than would fossil animals or pollens, many of which are too similar to look at the species level and in any case are dominated by the most abundant plants rather than showing those critical in the food chain.



Plants of the Arctic tundra in Nunavut, Canada (Photo credit: Wikipedia)

The first major success in palaeoecology of this kind came with a 50-author paper using eDNA 'bar-coding' of permafrost from 242 sites

in Siberia and Alaska I Willerslev, E. and 49 others 2014. Fifty thousand years of Arctic vegetation and megafaunal diet. *Nature*, v. **506**, p. 47-51. doi:10.1038/nature12921). Dividing the samples into 3 time spans – 50-25, 25-15 ([last glacial maximum](#)) and younger than 15 ka – the team found these major stages in the last glacial cycle mapped an ecological change from a dry tundra dominated by abundant herbaceous plants (forbs including abundant anemones and forget-me-not), to a markedly depleted Arctic steppe ecosystem then moist tundra with woody plants and grasses dominating. They also analysed the eDNA of dung and gut contents from ice-age megafauna, such as mammoths, bison and woolly rhinos, where these were found, which showed that forbs were the mainstay of their diet. Using bones of large mammals 6 member of the team also established the timing of extinctions in the last 56 ka (Cooper, A. *et al.* 2015. Abrupt warming events drove Late Pleistocene Holarctic megafaunal turnover. *Science*, DOI: 10.1126/science.aac4315), showing 31 regional extinction pulses linked to the rapid ups and downs of climate during [Dansgaard-Oeschger cycles](#) in the run-up to the last glacial maximum. By the end of the last glacial maximum, the megafauna were highly stressed by purely climatic and ecological factors. Human predation probably finished them off.

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[How far has geochemistry led geology?](#)

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Thin section of a typical granite: clear white and grey grains are quartz (silica); striped black and white is feldspar; coloured minerals are micas (credit: Wikipedia)

In the Solar System the Earth is unique in having a surface split into two distinct categories according to their relative elevation; one covered by water, the other not. More than 60% of its surface – the ocean basins – falls between 2 to 11 km below sea level with a mean around 4 to 5 km deep. A bit less than 40% – land and the continental shelves – stands higher than 1 km below sea level up to almost 9 km above, with a mean around 1 km high. Between 1 and 2 km below sea level is represented by only around 3 % of the surface area. This combined hypsography and wetness is reckoned to have had a massive bearing on the course of climate and biological evolution, as far as allowing our own emergence. The Earth's bimodal elevation stems from the near-surface rock beneath each division having different densities: [continental crust](#) is less dense than its oceanic counterpart, and there is very little crustal rock with an intermediate density. Gravitational equilibrium ensures that continents rise higher than oceans. That continents were underpinned mainly by rocks of granitic composition and density, roughly speaking, was well known by geologists at the close of the 19th century. What lay beneath the oceans didn't fully emerge until after the advent of plate tectonics and the notion of simple basaltic magmas pouring out as plates became detached.

In 1915 Canadian geologist [Norman Levi Bowen](#) resolved previously acquired knowledge of the field relations, mineralogy and, to a much lesser extent, the chemistry of igneous rocks, predominantly those on the continents in a theory to account for the origin of continents. This involved a process of distillation or fractionation in which the high-temperature crystallisation of mafic (magnesium- and iron-rich) minerals from basaltic magma left a residual melt with lower Mg and Fe, higher amounts of alkalis and alkaline earth elements and especially enriched in SiO₂ (silica). A basalt with ~50% silica could give rise to rocks of roughly granitic composition (~60% SiO₂) – the 'light' rocks that buoy-up the continental surface – through Bowen's hypothetical fractional crystallisation. Later authors in the 1930s, including Bowen's teacher [Reginald Aldworth Daly](#), came up with the idea that granites may form by basalt magma digesting older SiO₂-

rich rocks or by partially melting older crustal rocks as suggested by British geologist [Herbert Harold Read](#). But, of course, this merely shifted the formation of silica-rich crust further back in time

A great deal of field, microscope and, more recently, geochemical lab time has been spent since on to-ing and fro-ing between these hypotheses, as well as on the petrology of basaltic magmas since the arrival of plate theory and the discovery of the predominance of basalt beneath ocean floors. By the 1990s one of the main flaws seen in Bowen's hypothesis was removed, seemingly at a stroke. Surely, if a basalt magma split into a dense Fe- Mg-rich cumulate in the lower crust and a less dense, SiO₂-rich residual magma in the upper continental crust the bulk density of that crust ought to remain the same as the original basalt. But if the dense part somehow fell back into the mantle what remained would be more able to float proud. Although a neat idea, outside of proxy indications that such delamination had taken place, it could not be proved.

Since the 1960s geochemical analysis has become steadily easier, quicker and cheaper, using predominantly X-ray fluorescence and mass-spectrometric techniques. So geochemical data steadily caught up with traditional analysis of thin sections of rock using petrological microscopes. Beginning in the late 1960s igneous geochemistry became almost a cottage industry and millions of rocks have been analysed. Recently, about 850 thousand multi-element analyses of igneous rocks have been archived with US NSF funding in the [EarthChem](#) library. A group from the US universities of Princeton, California – Los Angeles and Wisconsin – Madison extracted 123 thousand plutonic and 172 thousand volcanic igneous rocks of continental affinities from EarthChem to 'sledgehammer' the issue of continent formation into a unified theory ([Keller, C.B. et al.](#) 2015. Volcanic-plutonic parity and the differentiation of the continental crust. *Nature*, v. **523**, p. 301-307).

In a nutshell, the authors compared the two divisions in this vast data bank; the superficial volcanic with the deep-crustal plutonic kinds of continental [igneous rock](#). The gist of their approach is a means of comparative igneous geochemistry with an even longer pedigree, which was devised in 1909 by British geologist [Alfred Harker](#). The Harker Diagram plots all other elements against the proportionally most variable major component of igneous rocks, SiO₂. If the dominant process involved mixing of basalt magma with or partial melting of older silica-rich rocks such simple plots should approximate straight lines. It turns out – and this is not news to most igneous geochemists with far smaller data sets – that the plots deviate considerably from straight lines. So it seems that old Bowen was right all along, the differing deviations from linearity stemming from subtleties in the process of initial melting of mantle to form basalt and then its fractionation at crustal depths. Keller and colleagues found an unexpected similarity between the plutonic rocks of subduction-related volcanic arcs and those in zones of continental rifting. Both record the influence of water in the process, which lowers the crystallisation temperature of granitic magma so that it freezes before the bulk can migrate to the surface and extrude as lava. Previously, rift-related magmas had been thought to be drier than those formed in arcs so that silica-rich magma should tend to be extruded.

But there is a snag, the EarthChem archive hosts only data from igneous rocks formed in the Phanerozoic, most being less than 100 Ma old. It has long been known that continental crust had formed as far back as 4 billion years ago, and many geologists believe that most of the continental crust was in place by the end of the Precambrian about half a billion years ago. Some even reckon that igneous process may have been fundamentally different before 3 billion years ago (see: Dhuime, B., Wuestefeld, A. & Hawkesworth, C. J. 2015. Emergence of modern continental crust about 3 billion years ago. *Nature Geoscience*, v. **8**, p.552-555). So big-science data mining may flatter to deceive and leave some novel questions unanswered .

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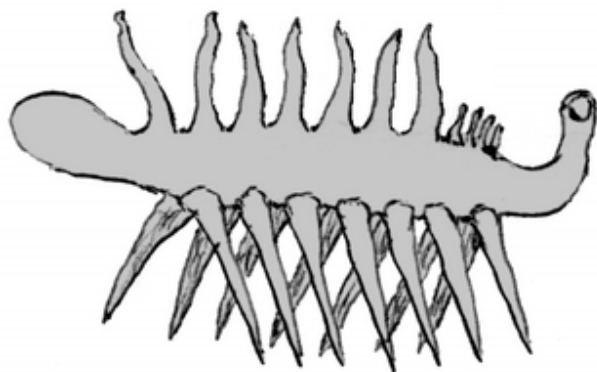
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[Hallucigenia gets a head](#)

Posted on [July 7, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

The [Middle Cambrian](#) Burgess Shale of the Canadian Rockies is one of those celebrated sediments that show extraordinary preservation of soft-bodied and easily disarticulated organisms and rich assemblages of fossils. Being one of the earliest known of such lagerstätten, many of the denizens of the ecosystem in which the shale originated were at first regarded as members of hitherto undiscovered and now vanished phyla, the basal branches of the 'tree of life'. Some certainly looked pretty odd, such as *Opabina* with a feeding apparatus looking similar to the extension nozzle of a vacuum cleaner; but that is clearly some kind of arthropod. Others turned out to be

astonishingly large, once it was realised that parts of their broken bodies had previously been taken to be different organisms, an example being *Anomalocaris*. But perhaps the oddest, certainly to palaeontologists, was *Hallucigenia*. However, there are plenty of even more weird and wonderful living creatures, such as the [sea pig](#), although modern creatures are more easily pigeonholed, taxonomically speaking.



Hallucigenia as originally reconstructed; i.e. upside-down. (credit: Wikipedia)

The trouble with *Hallucigenia* was not so much its complexity – it was a fairly simple-looking beast – but that there were two choices as to which way up it lived; a feature that surprisingly led to a great deal of pondering that ended with the scientist who formally described it in 1977 making the wrong choice. That was eventually resolved fourteen years later, but the creature might also have inspired [the Pushmi Pullyu](#) in Hugh Lofting's Dr Doolittle stories for children. Not that it resembled a unicorn-gazelle cross: far from it, for no-one could decide which its front was and which its backside, and even if it may have lain on its side. But *Hallucigenia* does demonstrate bilateral symmetry beautifully – it must have a front and back, and a top and bottom, even though which was which remained veiled in mystery – and so belongs to the dominant group of animals, imaginatively known as bilaterians.

The Burgess Shale lagerstätte seemingly was heaving with *Hallucigenia* so would-be taxonomists have had no shortage of specimens to ponder over in the 38 years since [Simon Conway Morris](#) made his dreadful mistake: of course, that was not of such enormity as Einstein's 'biggest blunder' in the form of his cosmological constant, and Conway Morris quickly accepted his error when the beast was turned right-way-up in 1991. The problem is, exquisite as they are, [Burgess Shale fossils](#) are flattened and all that remains of mainly soft-bodied animals are delicate carbonaceous films, which need electron microscopy to unravel.



The latest reconstruction of *Hallucigenia*, by palaeontological illustrator [Danielle Dufault](#)

In 2015, *Hallucigenia*'s front end was definitely found and a great deal more besides by Canadian palaeontologists Martin Smith and Jean-Bernard Caron of the Royal Ontario Museum and the University of Toronto (Smith, M.R. & Caron J.-B. 2015. *Hallucigenia*'s head and the pharyngeal armature of early ecdysozoans. *Nature*, v. **523**, p. 75-78). It has eyes, albeit rudimentary, and a throat, deep within which it has pointy teeth. *Hallucigenia* was a lobopod, whose living relatives lie within that large and diverse group the [Ecdysozoa](#), which all have throat teeth and include the wondrous water bear (tardigrade) and the velvet- and penis worms (onychophores and priapulids, respectively) as well as lobsters, flies and woodlice. It may indeed have been close to the last common ancestor of all animals who moult their carapaces.

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Spheroidally weathered basalt from Turkey. (credit: Francisco Sousa)

[Spheroidal weathering](#) of lavas, easily confused with pillows, is also found in other homogeneous igneous rocks. It develops from rectilinear joint sets along which the groundwater responsible for breakdown of silicates initially moves. Hydration reactions begin along the joints but proceed most quickly at corners so that curved surfaces begin to develop. The concentric banding that sometimes culminates in almost spherical relics may involve more than just rotting of anhydrous silicates as the reactions involve volume increases that encourage further rock fracturing. Other factors, such as elastic strain release may also encourage the characteristic concentricity. Prolonged, intense [chemical weathering](#) leaves [isolated, rounded corestones](#) surrounded by [saprolite](#), that can form boulder fields when the softer weathered material has been eroded away.

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[Are coral islands doomed by global warming?](#)

Posted on [June 18, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

Among the most voluble and persistent advocates of CO₂ emissions reduction are representatives of islands in the tropics that are built entirely of reef [coral](#). All the habitable land on them reaches only a few metres above high-tide level, so naturally they have more cause to worry about [global warming](#) and [sea-level rise](#) than most of us. Towns and villages on some [atolls](#) do seem to be more regularly inundated than they once were. So a group of scientists from New Zealand and Australia set out to check if there have been losses of

land on one Pacific atoll, [Funafuti](#), during the century since tidal observatories first recorded an average 1.7 mm annual rise in global sea level and a faster rate ($\sim 3 \text{ mm a}^{-1}$) since 1993 (Kench, P.S. *et al.* 2015. Coral islands defy sea-level rise over the past century: Records from a central Pacific atoll. *Geology*, v. **43**, p.515-518).



Funafuti atoll (Tuvalu) from space (credit: Wikipedia)

Funafuti atoll comprises 32 islands that make up its rim, with a range of sizes, elevations, sediment build-ups and human modifications. The atoll was first accurately surveyed at the end of the 19th century, has aerial photographic cover from 1943, 1971 and 1984 and high-resolution satellite image coverage from 2005 and 2014, so this is adequate to check whether or not sea-level rise has affected the available area and shape of the habitable zone. It appears that there has been no increase in erosion over the 20th century and rather than any loss of land there has been a net gain of over 7%. The team concludes that coral reefs and islands derived from their remains and debris are able to adjust their size, shape and position to keep pace with sea level and with the effects of storms.



Beach on Fongafale Islet part of Funafuti Atoll, Tuvalu. (credit: Wikipedia)

This is an observation of just one small community in the vastness of the Pacific Ocean, so is unlikely to reassure islanders elsewhere who live very close to sea level and are anxious. It is a finding that bears out longer-term evidence that atolls remained stable during the major sea-level changes of the post-glacial period until about 7 thousand years ago when land glaciers stabilised. Since coral grows at a surprisingly rapid rate, that growth and the local redistribution of debris released by wave action keep pace with sea-level change; at least that taking place at rates up to 3 mm per year. But the study leaves out another threat from global warming. Corals everywhere are starting to show signs of ill thrift, partly resulting from increasing acidity of seawater as more CO₂ dissolved in it and partly from increases in sea-surface temperature, as well a host of other implicated factors. This manifests itself in a phenomenon known as coral bleaching that may presage die-off. Should coral productivity decrease in the Pacific island states then the material balance shifts to land loss and sea level will begin an irresistible threat.

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[Flourishing life during a Snowball Earth period](#)

Posted on [June 18, 2015](#) by [Steve Drury](#) | [Leave a comment](#)

That glacial conditions were able to spread into tropical latitudes during the late [Neoproterozoic](#), [Cryogenian Period](#) is now well established, as are the time spans of two such events. <http://earth-pages.co.uk/2015/05/21/snowball-earth-events-pinned-down/> But what were the consequences for life that was evolving at the time? That something dramatic was occurring is signalled by a series of perturbations in the carbon-isotope composition of seawater. Its relative proportion of ^{13}C to ^{12}C ($\delta^{13}\text{C}$) fell sharply during the two main Snowball events and at other times between 850 to 550 Ma. Since ^{12}C is taken up preferentially by living organisms, falls in $\delta^{13}\text{C}$ are sometimes attributed to periods when life was unusually suppressed. It is certain that the 'excursions' indicate that some process(es) must have strongly affected the way that carbon was cycled in the natural world.



Artist's impression of a Snowball Earth as it would appear with today's continental configuration adjacent to the East Pacific Ocean. (Photo credit: Wikipedia)

The further sea ice extended beyond landmasses during Snowball events the more it would reduce the amount of sunlight reaching the liquid ocean and so photosynthesis would be severely challenged. Indeed, if ice covered the entire ocean surface – the extreme version of the hypothesis – each event must have come close to extinguishing life. An increasing amount of evidence, from climate- and oceanographic modelling and geological observation, suggests that a completely icebound Earth was unlikely. Nevertheless, such dramatic climate shifts would have distressed living processes to the extent that extinction rates were high and so was adaptive radiation of survivors to occupy whatever ecological niches remained or came into being: evolution was thereby speeded up. The roughly half-billion years of the Neoproterozoic hosted the emergence and development of multicellular organisms (metazoan eukaryotes) whose cells contained a nucleus and other bodies such as mitochondria and the chloroplasts of photosynthesisers. This hugely important stage of evolution burst forth shortly after – in a geological sense – the last Snowball event, during the [Ediacaran](#) and the [Cambrian Explosion](#). But recent investigations by palaeontologists in glaciogenic rocks from China unearthed a rich diversity of fossil organisms that thrived during a Snowball event (Ye, Q. *et al.* 2015. The survival of benthic macroscopic phototrophs on a Neoproterozoic [snowball Earth](#). *Geology*, v. **43**, p. 507-510).

The Nantuo Formation in southern China contains glaciogenic sedimentary rocks ascribed to the later [Marinoan glaciation](#) (640 to 635 Ma). Unusually, the pebbly Nantuo glaciogenic rocks contain thin layers of siltstones and black shales. The fact that these layers are free of coarse fragments that floating ice may have dropped supports the idea that open water did exist close to glaciated landmasses in what is now southern China. Palaeomagnetic measurements show that the area was at mid-latitudes during the Marinoan event. The really surprising feature is that they contain abundant, easily visible fossils in the form of carbonaceous ribbons, disks, branching masses and some that dramatically resemble complex multi-limbed animals, though they are more likely to be part of an assemblage of algal remains. Whatever their biological affinities, the fossils clearly signify that life happily flourished beneath open water where photosynthesis provided a potential base to a food chain, though no incontrovertible animals occur among them.

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See also: Corsetti, F.A. 2015. Live during Neoproterozoic Snowball Earth. *Geology*, v. **43**, p. 559-560.