Climate, Volcanoes and Humans: hands-on for the classroom

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Meetings | Publications | Outreach | www.equ.eu









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https://www.egu.eu/education/field-officers/

R. Baskar

Goal:

providing professional development for school teachers and future teachers, from primary to secondary schools, in teaching the elements of geoscience appropriate for their teaching curriculum, through interactive workshops.



Since May 2019...

National workshops



Images: Gina P. Correia, Giulia Realdon



Since May 2019...

International workshops



NOSTE 2021, International Research Conference, Training Workshop and Biennial Convention



Since May 2019...

Conferences





Since May 2019...

III Jornada de História da Ciência e Ensino e II Congresso demacional de História da Ciência no Ensino Volume 23, 2021 - sur

a textos escolares da época paleobabilónica, como um convite para a reflexão sobre a história da matemática e do ensino de matemática. Os participantes devem ter á mão papel, lápis e borracha.

Atividades Low-cost que funcionam sempre

Gina P. Carrel Xavier Juan

a das principais estratégias da Comissão de Educação (CoE) da European Geosciences Unior (EOU) è to spread first-hand scientific information to science teachers of secondary (and primary) schools, significantly shortening the time between discovery and textbook, and to provide the teachers with meterial that can be directly transferred to the classroom' (seleate da EGU). Neete contexts, a EGU CoE juntamente com a International Geoscience Education Organisation (IGEO) e a International Union of Geological Sciences (IUGS) langaram um programa alicerpado na figura do Geoscience Education Field Officer (FO), com o objetivo de proporcionar uma rede de formadores, que contribuam para o remo chicke (*-0), toto togetto o togetto appropriate and read read an interaction, gas bornadare para de la desenvolvimenta porte para para deste programa desarre desarre para e da curso a e do mundo. A primeira etapa deste programa desarre accores em Viena, em abril de 2019, durante a Assembleira esta desarre para deste programa desarre accores em Viena, em abril de 2019, durante a Assembleira esta desarre para deste programa desarre desarre esta desa Geral da EGU, Sob a orientação do Professor Chris King, seis professores de diferentes países foran mados como FOx: quatro EGU FOx, de França, fiáia, Portagal e Espanha, e dos IGEO/ IUGS FOx de anocos e da Índia. A pandemia atraacu a formação de vários outros FOx, incluindo urna colega de um pais sui-americano, o Chile. Os FOs promovem oficinas intenstivas para professores no seu próprio pais organtilhando experiências entre os participantes. As oficinas baseiam-se em atividades criadas e grafultamente pela equipa do weissite Earthieamingidea. Deste último, poder



bstract

CASE

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Geoscience Education Field Officer International programme:...

Gina P. Correia B Giulia Realdon B Guillaume Coupechoux Xavier Juan
Ramanathan Baskar
Yamina Bourgeoini
Chris King

... The first year of activity (May 2019-April 2020)

Keywords: Earth Science, EGU-IUGS/IGEO, Field me, hands-on activities national programme, teaching geosciences

In this critical context of the provision of

ofessional development, a remarkable exception

ttps://www.earthlearningidea.com/), accounting or over 4.7 million downloads throughout the orld by May 2020

ft.

Introduction

cation Field Officer (FO) sched in 2019 by the

professional development, a remarkable exception is the experience of the farth Science Education Unit (ISEU), originally based at Heele University (UN), which developed an immovative tracher training method based on interactive hands-on-vershorbs and a walk of teaching resources. These have been successfully used since 1999 the 40,000 teaching across the UK bring & Thomas and the second second second second the second second second second second teaching second secon At the international level, the European Geoscient Union (EGU) Committee on Education (CoE), in aiming at *Trapiring, updating and supporting*

11 SASE International No 10 Geoscience 08/20



Watery world - hands-on experiments from Earthlearning

eed inspiration for teaching about fresh water on Earth? Try these Earthlearn

"To understand, conserve, preserve, and is important to understand the processe

land, but also to connect them to the big

bal water cycle. This is especially true o

where a growing population needs an of a limited resource - clean fresh water

affected by multiple anthropogenic pres

The importance of fresh water is ce

Agenda 2030 Sustainable Development

Clean Water and Sanitation) identified

or classroom activities that can be performed with very little equipment.

The importance of water

Vater is one of the defining features of the Earth. Most waer is sea water (about 97%), while fresh water accounts for Introduction While gooticines topics are included in most primary and secondary school national curricula or transmarks around the worki (Geoc & Amberg, 2016; King, 2013; King, 2019), the need for improving generatives distants in the born recognised arout the 1990s by researchers and educators of nly 2.5%, most of which is ice. For liquid fresh water (0.8% f total water on Earth), the ratio of surface water/ground rater is around 1:25. ontinental liquid water, despite being a tiny part of the Earth's vater stock, and unevenly distributed, is the part that most ifferent countries (King, 2008). In fact, according to affects human life and drives important processes on land. report by the International Geoscience Education inisation (IGEO), there is 'a huse and disturbine er processes on land are connected to the global water p between the importance of Earth Science to the e of humankind and its low status in schools fate of humaniking and its low status in schools worldwide' (Gence & Amburg, 2016, p. 9) because of the weak subject background of many teachers, and uneven availability of good quality teaching materials and testbooks and of professional development opportunities (Greco & Almberg, 2016; King, 2019).

ons. Climate change and population growt sing a global water crisis. Currently, a stag people around the world do not have saf ycle, which moves water and heat through the ocean, the mosphere, the biosphere, and the continents.

O Geoscience **Education Field** Officer

Gina P. Correia*, Hélder Pereira*, Chris King* *CITEUC/ Universidade de Coimb 'Escola Secundária de Loulé Keele University

EGU (European Geosciences Union) Education Field Officer programme: teachers' appreciation, perceptions and needs

Giulia Reakton¹⁴, Guillaume Coupechoxor², Gina P. Correia³, Xavier, Juan⁴, Ran aroin⁴ and Chris King

Antile, after mitter, Action de content, Action de content, Action de develop "Meloro" aux env "Meloro" aux env "Meloro" aux env "Yellon", Yellon", e Education old then run India: Italy,

	ces workshops et sur les perceptions et les bessins des enseignants qui y ont participé.	enfocantos en los resultados de los talleres, en las percepciones y necesidades de los profesores que existienon.
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mente na sua vertente mais prática. científica, justifica a necessidade de ores desta área do conhecimento. No eu a figura de Geoscience Education edagógicas inovadoras para o ensino preocupação deste organismo euro-

nover um conjunto nsino das deociên o desenvolviment

ntre os quais 120 p r as ameacas globa spostas para dese sse conhecimento sociedade global, é nacionais de nível bá rifique a existência is programas são cu mação inicial dos A estes constrang

EGU GEOSCIENCE EDUCATION FIELD OFFICERS

Publications

Gina Pereira Correia¹ & Chris King² *EGU Geoscience Education Field Officer. CITEUC - Centre for Earth and Space Research of the University of Cosmbra (PCRTUGAL) *EGU Committee on Education (Chair), Emention Profession of Earth Science Education, Kieele University (UNITED KINGDCM) pina marial

As a strategy to support geoscience education across Europe and beyond, the European Geosciences Union (EQU) Committee on Education, has devised a new project involving Geoscience Education Field Officers (FO). In the first pilot year, four FO have been appointed and trained, in Portugal, France, taky and Spain. They will represent EQU in their contrins with

Keywords: Earth Learning Idea; Earth-science Education; European Geosciences Union Training; Workshops.

REFERENCES

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King, C. J. H. (2007). Enseñar Geologia a los profesores de ciencias: la experiencia de la Earth Science Education Unit (ESEU). Ensenanza de Ciencias de la Tierra, 14(2), 142-149.

King, C. & Thomas, A. (2012) Earth Science Education Unit workshops – an evaluation of their impact. School Science Review, 94(347) 25-35.



At present...





In the future...





Workshops:

- Interactive;
- Hands-on;
- Activities: practical, simple and, overall time, speedy;
- Materials: inexpensive, easy to obtain/build and/or readily available in normal school classrooms and science labs.

Topics:

Plate tectonics | Rock cycle | Seismology | Time Scale and history of Earth | Volcanology | Hydrology and oceanography | Geopark training courses.



Earth Sciences for Society	www.earthlearningid Earth Learn Innovative, Earth-rel	ning Idea
	ELI Translations	
Earth as a System Earth Energy/Processes Earth in Space Earth Materials Evolution of Life Geological Time Investigating the Earth Natural Hazards Resources and Environment Cross-category ELIs	Image: Castellano Proyecto Internacional de Investigación Ecatalà Proyecte Internacional de Recerca Image: Norak Image: Norak	<section-header><section-header><section-header><section-header><section-header><section-header><section-header><section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header></section-header>

- 387 available activities
- Explanatory videos
- Translated into different languages
- 2008 to 2022
 > 5.700.000 downloads

http://www.earthlearningidea.com

49,324





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James Hutton – or 'Mr. Rock Cycle'? Thinking towards the rock cycle, the Hutton way

James Hutton - Try thinking like James Hutton in the 1700s by asking these questions. Remember that, at that time, most people thought that the oldest rock on Earth was granite, which had crystallised from an early ocean, and all other rocks lay on top; the Earth had formed like this, just 6000 years ago.



Soil - Hutton was a farmer. He observed that soil was being eroded all the time but that a thick blanket of soil always remained. He asked himself Where does the new soil come from? So - where does new soil come from?

A. New soil is formed as decaying plants mix with weathered rock, helped by animals like worms in the soil – so it is a result of rock weathering.

Sedimentary rocks - Hutton saw that beds of sedimentary rocks looked like the layers in modern sediments. He asked, 'Why do sedimentary rocks look like modern sediments? So - why are

sedimentary rocks similar to modern sediments? A. Sedimentary rocks were modern sediments once, deposited long ago, before becoming hardened into rocks. This idea that ancient rocks were originally formed by processes active on Earth today, was later called; the principle of Uniformitarianism - simply stated, the present is the key to the past:

Uplift - Hutton observed that while the land was being eroded all the time, it never went below sea level. He asked himself, 'Why is the Earth's surface never eroded below sea level?' So - why is this so? A. There must be some process that lifts bedrock up

from time to time – that we now call uplift. At Hutton's time steam engines were being developed and showed that things expanded when they became hot. Hutten saw that some layers of rocks had been tilled upwards. He asked himself, Could the heating of deep layers of rocks cause rocks to be bent upwards and uplifted? So - could this be so?

A. It is possible that heating deep rocks could cause some uplift, but we now know that the main mechanism causing uplift is Plate Tectonics, which wasn't understood until the 1960s.



Cycles - Hutton's fieldwork showed that where rocks were tilted upwards, they could be baided and new sedimentary layers could be laid down on the top. He thought, Could there be more than one cycle of sediment being deposited, hardened into rock and then uplifted? So -can three be more than one cycle like this? If so, what is the cycle called? We now know that there can be many cucles of

 we now know that there can be many cycles of deposition, rock-formation and uplith – this is the sedimentary part of the 'the rock cycle'. The place where new sedimentary layers were deposited on top of older uplitted and eroded layers we now call an 'unconformity'.

Granite - Although most people at the time thought granite had crystallised from an ancient sea, Huttor's fieldwork showed that it had once been molten. What clues might Hutten have found to show that granite was once molten magma? A. He tound places where the granite had flowed into the surrounding nock, as dykes and years.

Time - Hutton asked himself, 'How long would it take for rocks to be cycled?' So - how long do you think it would take for old uplifted rocks to be eroded, new layers to be deposited, made into rocks and uplifted again? A - button hard no idea of the amount of time this

• Fullibly match order of three announces of the time time must have taken, but when one of his firends mails aged what Hutton was saying, he wrote, The mind sees and to gain agethy by lowinging your for the cycles had, no vestige of a beginning - no prospect of an end. New we know that a complete tum' of the rock cycle takes millions of verses.

Rock cycle - Which parts of the rock cycle had Hutton 'discovered' in his work?

- A. Hutton understood weathering and erosion, sediment deposition, how sedimentary and igneous (granite) rocks were formed, that rocks were uplifted, and that all this would take a lot of time – time that we now call geological time'. Hutton 'discovered' most of the rock cycle – maybe
- Hutton 'discovered' most of the rock cycle may we should now call him, 'Mr. Rock Cycle'!

Earthlearningidea – www.earthlearningidea.com

The back up Title: James Hutton – or 'Mr. Rock Cycle'

Subtitle: Thinking towards the rock cycle, the Hutton way.

Topic: A series of questions and answers that attempt to outline the possible thoughts of James Hutton as he developed his ideas in the context of what we now call the rock cycle.

Age range of pupils: 14 – 18 years

Time needed to complete activity: 15 mins

Pupil learning outcomes: Pupils can:

 describe and explain how Hutton's thinking may have developed towards the 'rock cycle' idea;

- show understanding of many of the
- processes and products of the rock cycle.

Context: Study of James Hutton's book 'Theory of the Earth', published in 1788 shows that he had developed many of the ideas that we have now come to associate with the rock cycle. Hutton's work didn't become widely known until it was publicised by John Playfair in his book, Illustrations of the Huttonian Theory of the Earth published in 1802. After that, Hutton's ideas were widely used and developed, particularly by Charles Lyell in his three volume book, 'The Principles of Geology' published between 1830 and 1833, Lyell's work, in turn, strongly influenced Charles Darwin as he developed his theory of evolution. For these reasons, Hutton is now widely regarded as 'the Founder of Modern Geology'. Hutton was a Scottish farmer and naturalist, who travelled widely and played a vital role in the development of scientific and other ideas in Scotland in the late 1700s (the time called 'the Scottish enlightenment')

Following up the activity: Follow up the development of Hutton's thinking by following Darwin's thinking in the 'Darwin's 'big soil idea' and 'Darwin's 'big coral atoll idea''

Earthlearningideas. Try to make your own unconformity using the 'The Himalayas in 30 seconds!' activity, by removing the top of the folds and replacing them with horizontal lavers of sand and flour.

Underlying principles:

- Rocks at the Earth's surface are weathered and then eroded to form sediment.
- Sediment is deposited in layers to form sedimentary sequences.
- Sedimentary sequences become sedimentary rocks.
- Granite is formed by slow crystallisation from magma.
- Rocks are uplifted by natural Earth processes; this allows the rock cycle to continue cycling.
- A full 'turn' of the rock cycle takes millions of vears.

Thinking skill development:

Thinking like Hutton' involves bridging between the current ideas of the pupils and the ways in which geologists may have thought in the past. By its nature, such a process also involves construction, cognitive conflict and metacognition.

Resource list: imaginative minds

imaginative

Useful links:

You can find more about James Hutton, how his thinking developed, and how important this was in the development of geology, by typing "James Hutton" into an internet search engine, like *Google*.

Source: Developed by Chris King of the Earthlearningidea Team.

C Extinhearringides team. The Extinhearringides team seeks to produce a teaching idea every veek, at minimal cost, will minimal resources, for teacher educators and teachers of Extin visionent through school-level geography or science, with an online discussion around very idea in order to develop a global support network. 'Earthearringides' has title funding and is produced largely by volurary effort.

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Why to use hands-on models and simulations to teach geosciences?

 Geosciences study phenomena rarely first-hand accessible: ... too big ... too slow ... too far
 Sometimes dangerous!



Images: Dorian Wallender CC-BY, Thomei08 public domain, NOAA public domain, Etna Park

- They possibly remain theoretical concepts, far from experience, difficult to visualize, understand, remember, apply...
- The use of practical labs with low-cost materials can be a resource for teachers, especially when well equipped labs are not available



Workshop theoretical base: the CASE model



CASE - Cognitive Acceleration through Science Education Programme

Earthlearningideas using the CASE approach to develop thinking skills

An Earthlearningidea workshop





Climate, Volcanoes and Humans: hands-on for the classroom activities

- See level in a plastic cup Eight ways to change the water level in a plastic cup – and global sea level.
- Melting ice and sea level change 1 and 2 ice caps Does sea level change when floating sea ice melts? And when ice caps melt?
- Geobattleships Do earthquakes and volcanoes coincide?
- See how they run Investigate why some lavas flow further and more quickly than others.
- Volcano in the lab Modelling igneous processes in wax and sand.
- The toilet roll of time Evolution of life
- Interpret Earth temperatures from simulated deep-sea and ice cores Using sweets to simulate oxygen isotope ratios in cores.
- The oxygen isotope sweet simulation Demonstrating how the oxygen isotope proxy records past Earth temperatures.



Retrieved from: https://www.earthlearningidea.com/PDF/369_Global_sea_level.pdf

See level in a plastic cup - Eight ways to change the water level in a plastic cup - and global sea level.

Materials:

- a transparent plastic cup of water
- (optional) a source of ice and a marker pen



Image: Clinton Conrad



Retrieved from: https://www.earthlearningidea.com/PDF/322_Melting_ice_sea_level_1.pdf

Melting ice and sea level change 1 - ice caps - Does sea level change when floating

sea ice melt?

Materials:

- 500 ml measuring cylinder
- water
- crushed ice
- food colorant



1.150 ml of coloured water

2. 210 ml after adding ice, Images: Earthlearningidea



where the level remained after it had all melted



Retrieved from: https://www.earthlearningidea.com/PDF/323_Melting_ice_sea_level_2.pdf

Melting ice and sea level change 2 – ice caps - Does sea level change when ice caps melt?

Materials:

- 500 ml transparent beaker or similar
- flat non-floating objects, e.g. 100g masses
- water
- ice cubes
- ruler



1. Coloured water up to about 280 ml.



2. Ice cubes added and water level marked.



Water level rises to 450ml when all the ice has melted.

Images: Earthlearningidea



Retrieved from: https://www.earthlearningidea.com/PDF/79_Geobattleships.pdf

Geobattleships - Do earthquakes and volcanoes coincide?

Materials:

- sets of sheets for pairs of students, as supplied
- one student in each pair is handed a map of the distribution of volcanoes, with a blank map beneath
- the other student is handed a map of the distribution of earthquakes with a blank map beneath
- pencils



Images: Earthlearningidea



Geobattleships - Do earthquakes and volcanoes coincide?





Retrieved from: https://www.earthlearningidea.com/PDF/See_how_they_run.pdf

<u>See how they run - Investigate why some lavas flow further and more quickly than</u> others.



Images: Kilauea, USGS and Mont St. Helens, Mike Doukas, public domain





Retrieved from: https://www.earthlearningidea.com/PDF/See_how_they_run.pdf And https://www.earthlearningidea.com/Video/Extrusion.html

See how they run - Investigate why some lavas flow further and more quickly than

others.



Materials:

- three identical small clear plastic or glass containers with lids, such as empty drinks bottles (if in a laboratory, use boiling tubes).
- any harmless viscous liquid such as treacle, syrup or hair shampoo, whose viscosity is dependent upon temperature.
- a source of heat and a water bath (bowl of hot water) into which the containers can be immersed.
- a stop-clock or a smartphone
- a thermometer, if available.



Retrieved from: https://www.earthlearningidea.com/PDF/See how they run.pdf And https://www.earthlearningidea.com/Video/Extrusion.html

See how they run - Investigate why some lavas flow further and more quickly than

others.



Materials:

- any harmless viscous liquid such as treacle, honey. syrup or hair shampoo, whose viscosity is dependent upon temperature
- a tile
- a stop-clock or a smartphone
- a small quantity of sugar or dry sand
- A few drops of water

Video: Giulia Realdon



Retrieved from: https://www.earthlearningidea.com/PDF/89_Volcano_in_the_lab.pdf

Volcano in the lab - Modelling igneous processes in wax and sand.

Materials:

- 500ml glass beaker
- coloured candle wax
- washed sand
- cold water (preferably chilled in a fridge)
- a Bunsen or camping burner, tripod, gauze, heatproof mat, gas supply, matches
- eye protection, or safety screen



Image: Peter Kennet

Note: Although a wax 'eruption' may appear to be a dangerous activity, experience has shown that the worst that can usually happen is that the beaker cracks if it is heated too strongly, allowing some warm wax and water to trickle down.



Retrieved from: https://www.earthlearningidea.com/PDF/89_Volcano_in_the_lab.pdf

Volcano in the lab - Modelling igneous processes in wax and sand.

Before the burner is lit, ask the students to predict what will happen as the contents of the beaker heat up:

- Which will melt first the wax or the sand?
- What will happen to the wax once it has melted?
- Why will it rise?
- Will any of the molten wax reach the top of the water?
- Will any of the molten wax set in the water?
- Will the molten wax convect round the beaker?

Then heat up the beaker and ask students to watch carefully throughout, from a safe distance or behind a safety screen



Retrieved from: https://www.earthlearningidea.com/Video/RC_review2.html

Volcano in the lab - Modelling igneous processes in wax and sand.

Rock cycle review

The rock cycle in wax
A wax volcano in the lab
The rock cycle at your fingertips



Retrieved from: https://www.earthlearningidea.com/PDF/234_Toilet_roll_of_time.pdf

Evolution of life - The toilet roll of time

Materials:

- 46 sheets from a toilet roll
- the timeline marker sheet
- a felt-tipped pen
- scissors
- a means of attaching the timeline markers to the toilet roll (e.g., glue, staples)

Timeline			
Event	Geological time (years ago)		
Today – the future begins here	0		
Today – the future begins here	years		
Oldest stone tools	3,300,000 years		
India/Eurasia collision –	50,000,000		
Himalayan Mountains formed	years		
K-Pg (K-T) mass extinction -	65,000,000		
dinosaurs became extinct	years		
Early flowering plants	130,000,000 years		
Beginning of the opening of the	190,000,000		
Atlantic Ocean	years		
Early birds	160,000,000		
	years		
Early mammals	220,000,000 years		
The 'great dying' mass	251,000,000		
extinction	years		
Supercontinent of Pangaea	300,000,000		
assembled	years		
Early reptiles	315,000,000 years		
	370,000,000		
Early amphibians	years		
Early insects	400,000,000		
	years		
Early land plants	430,000,000 years		
	530,000,000		
Early fish	years		
'Cambrian explosion – life with	545,000,000		
shells and other hard parts	years		
Early multicelled organisms	2,000,000,000 years		
Early organisms with cells	2,100,000,000		
containing nuclei (eukaryotes)	years		
Build-up of free oxygen in	2,700,000,000		
atmosphere	years		
Early bacteria and algae	3,500,000,000 years		
	4,000,000,000		
Oldest known Earth rocks	years		
Origin of the Earth – geological time begins here	4,567,000,000 years		



Retrieved from: https://www.earthlearningidea.com/PDF/234_Toilet_roll_of_time.pdf

Evolution of life - The toilet roll of time



Each sheet can represent 100,000,000 years - one hundred million years



Images: Gina P. Correia



Retrieved from: http://www.earthlearningidea.com/Video/Evolution_60s.html

Evolution of life





Interpret Earth temperatures from simulated deep-sea and ice cores - Using sweets to simulate oxygen isotope ratios in cores.

Materials:

- A few bags of sweets that can be divided into different colours
- A stack of plastic stacking beakers
- Paper and scissors to cut paper disks



Interpret Earth temperatures from simulated deep-sea and ice cores - Using sweets

to simulate oxygen isotope ratios in cores.

Demonstration:

Sweets represent oxygen isotopes :

- Darker coloured sweets represent water with heavy oxygen - ¹⁸O
- Paler-coloured sweets represent water with normal oxygen - ¹⁶O



Different layers with different ratios

Image: Chris King



Interpret Earth temperatures from simulated deep-sea and ice cores - Using sweets

to simulate oxygen isotope ratios in cores.

Demonstration :

Some circular disks of paper put at the bottom of a set of stacking plastic beakers represent one layer in a core The repetition of plastic beaker representes a « core » of different layers with different ratios



Different layers with different ratios

Image: Chris King



Interpret Earth temperatures from simulated deep-sea and ice cores - Using sweets to simulate oxygen isotope ratios in cores.

Questions for the students :

Draw a graph of Earth temperature against core depth given that :

- If the core is a simulated ice core the less ¹⁸O it contains, the colder Earth's temperature will be, vice versa.
- If the core is a simulated deep-sea sediment core the more ¹⁸O it contains, the colder Earth's temperature will be, vice versa.



Interpret Earth temperatures from simulated deep-sea and ice cores - Using sweets

to simulate oxygen isotope ratios in cores.

Time to experiment together !





The oxygen isotope sweet simulation - Demonstrating how the oxygen isotope proxy records past Earth temperatures.

Materials:

- a few bags of sweets that can be divided into different colours
- 3 plastics containers
- a tray
- labels



The oxygen isotope sweet simulation - Demonstrating how the oxygen isotope proxy records past Earth temperatures.

Demonstration:

Sweets represent oxygen isotopes :

- Darker coloured sweets represent water with heavy oxygen - ¹⁸O
- Paler-coloured sweets represent water with normal oxygen - ¹⁶O



Image: Chris King



The oxygen isotope sweet simulation - Demonstrating how the oxygen isotope proxy records past Earth temperatures.

Demonstration :

Two possibilities :

- Warmer Earth during an interglacial
- Colder Earth during a glacial period



Image: Chris King



The oxygen isotope sweet simulation - Demonstrating how the oxygen isotope proxy records past Earth temperatures.

Questions for the students :

- Why the density of a water molecule affects its rates of evaporation and condensation ?
- How in air masses moving from the tropic the ¹⁶O/¹⁸O proportion changes ?
- How the amount of change of rainfall which depends, in turn, on the temperature of the Earth at the time ?
- How ¹⁸O proportions in ice core or in deep-sea core layers can indicate interglacial or glacial period ?



The oxygen isotope sweet simulation - Demonstrating how the oxygen isotope proxy records past Earth temperatures.

Time to experiment together !





Evaluation form

https://forms.gle/6VTGsoy9WVFVNud56



Contacts to request EGU/IUGS-IGEO teachers' workshops in:

- France: edu-fo-fr@egu.eu
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