



Our Changing Planet

A report on the 2014 GIFT workshop

This year the GIFT, [Geosciences Information For Teachers](#), workshop united 84 teachers from 18 different countries around the general theme, [Our Changing Planet](#).

The theme of the 2014 GIFT workshop was chosen on the occasion of the publication of the IPCC (Intergovernmental Panel on Climate Change) 5th Assessment Report on climate change. The EGU Committee on Education felt that this event, publicised worldwide, would attract much attention from secondary schools students, and therefore that it was important to provide the teachers with direct and timely information on the latest IPCC results.

The workshop took place from 27 to 30 April, at the EGU 2014 General Assembly, and started with a welcome from Günter Blöschl, the EGU President. Then, Thomas Stocker, Co-Chair of the IPCC Working Group I (The Physical Basis), took to the stage to discuss the main achievements of recent years in climate-change science, focusing on three main points: observations, understanding and future. Based on multiple lines of independent evidence from the atmosphere, the ocean and the cryosphere, the IPCC has concluded that warming in the climate system is unequivocal. Since 1951 the Earth has warmed by about 0.6 to 0.7 °C, which is one manifestation of a change in the energy balance of the Earth. Stocker explained that this arises from positive radiation forcing caused by the increase in the concentration of greenhouse gases and a smaller cooling contribution by the increase in aerosols. Therefore, it is *extremely likely* (this is the IPCC terminology) that more than half of the observed increase in global average surface temperature from 1951 to 2010 has been caused by anthropogenic factors.

Stocker also emphasised that a new and very important element of the latest IPCC assessment is the recognition of the almost linear relationship between the total cumulative emissions of CO₂ and the global mean surface warming of the late 21st century. This means that if we want to limit global warming to 2 °C with respect to the mid-19th century, the total amount of carbon emitted since then must be less than 790 billion tons. Of these, 535 billion tons have already been emitted, leaving us with 255 billion tons to be spent! At the present rate of emission of about 10 billion tons per year, that leaves us with about 25 years, beyond which – if no reduction in emissions is obtained – it will be impossible to meet the 2 °C warming target. This is one of the most important messages of the IPCC assessment to policymakers.

Thomas Blunier (University of Copenhagen) and Valérie Masson-Delmotte (Laboratoire des Sciences du Climat et de l'Environnement [LSCE], Gif-sur-Yvette) then explained how climate factors can be



Valérie Masson-Delmotte during her presentation. (Credit: Filippo Camerlenghi)

retrieved from ice cores in Greenland and Antarctica. After a presentation on the technical aspects of ice coring, Blunier focused on the reconstruction of past atmospheric composition based on the air bubbles contained in the ice. Masson-Delmotte explained how the study of different isotopic ratios allows researchers to reconstruct past variations in temperature.

The informative lectures were followed by an afternoon dedicated to hands-on activities led by Sally Dengg (GEOMAR, Kiel) and Francesca Ugolini (Institute of Biometeorology, Florence). The following day Francesco Sarti (ESA's European Space Research Institute, Frascati) explained how space observations can be used in monitoring changes of the Earth's global environment. A 'space view' was also used by Anny Cazenave (Laboratoire en Géophysique et Océanographie Spatiale, Toulouse) to obtain a precise estimate of very recent sea level rise, a threat to so many countries worldwide.



Hands-on activity on ocean acidification. (Credit: Filippo Camerlenghi)

Laurent Bopp (LSCE, Gif-sur-Yvette) addressed the problem of carbon exchanges between reservoirs involved in its global cycle and their changes over time. The major issues deal with understanding past variations of atmospheric CO₂ and estimating the evolution of atmospheric CO₂ in response to anthropogenic carbon emissions over the next decades and centuries.

The issue of how increased absorption of CO₂ by the ocean leads to ocean acidification and to major changes in the marine biosphere was addressed by James Orr (both at LSCE, Gif-sur-Yvette and International Atomic Energy Agency, Monaco).

Larry Mayer (University of New Hampshire) then described the recent changes in ice cover in the Arctic Ocean: between 1979 and 2012 the annual mean extent of the Arctic Ocean has decreased by about 4% per decade with the summer sea ice minimum decreasing between about 9 to 13%, and there is a steady loss of old, thick, multi-year ice, and the rate of loss is increasing. Projected in the future, these trends indicate that the Arctic Ocean may have a nearly ice free season by the middle of the century, with huge consequences for global climate.

The impact of climate change on agriculture has also been discussed by Bernard Seguin (Institute National de Recherches Agronomiques, Avignon). Observed changes in agriculture and livestock resulting from the recent warming are still hardly detectable, except for advances in phenology. But projections indicate that at low latitudes even moderate temperature increases are likely to have negative yield impacts for major cereals. Further warming has increasingly negative impacts in all regions.

Finally, Stephen Macko (University of Virginia) addressed a general conclusion with a talk on 'Implication of a changing Earth: obvious and cascading', which explored and summarised the very different aspects of climate change discussed during the GIFT workshop. Macko has showed how some aspects of climate change have a clear direct relationship to human activities, whilst others result from a cascading process, such an increase in the release of methane and an increase in global temperature.

Moreover, as in every GIFT workshop, a poster session, 'Science in tomorrow's classroom', was included in the programme. The



Phil Smith (educator at Teacher Scientist Network, Norwich, UK and member of the EGU Committee on Education) and Ana Sousa (teacher at Escola Secundária Domingos Rebelo, Açores, Portugal) discuss in front of Sousa's poster during the 'Science in tomorrow's classroom' poster session at the EGU 2014 General Assembly. (Credit: Miguel Nata)

work presented at the session was aimed at various educational levels, from schools to post-graduate education and beyond, and included 60 GIFT teacher presentations together with 15 university contributions on undergraduate, post-graduate and outreach pedagogy. The teachers presented their projects on field, laboratory and classroom work. They also discussed their activities with each other and took away new ideas for enhancing their teaching in the future. Each GIFT teacher received a certificate of participation in the recognition of their efforts, and they can use the EGU posters in their schools to show their pedagogy to students, other teachers and parents.

In the two and a half days of the 2014 GIFT workshop we had time to describe and discuss the major aspects of the IPCC 5th Assessment Report. We feel confident that these presentations will help teachers in transmitting the major notions to their pupils (our ambassadors to the future!).

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