

Wallace Broecker

2008 Balzan Prize for the Science of Climate Change

For his extraordinary contributions to the understanding of climate change through his discoveries concerning the role of the oceans and their interactions with the atmosphere, as well as the role of glacial changes and the records contained in ice cores and ocean sediments. His contributions have been significant in understanding both gradual and abrupt climate change.

Past Patterns of Precipitation and Earth Temperature Global Climate Change Research Foundation

Adviser for the General Balzan Committee: Enric Banda

The general aim of Wallace Broecker's Balzan Research Project is to determine whether the paleoclimate record can support the prediction according to which, as the planet is warmed by fossil fuel CO₂, precipitation will be more strongly focused on the Equator. Lacking an adequate warm analogue, a cold one – namely, the situation during the last glacial period – has been already used with encouraging results (i.e., less focusing of rainfall on the tropics during colder times). However, possible flaws in the cold analogue have yet to be evaluated. Research activities focus on data from different sources, including deep sea sediments and closed-lake basin size, cave deposits and ice core records. Wallace Broecker is supporting three postdoctoral fellows:

- Jimin Yu. As part of his Ph.D. research at Cambridge University, he demonstrated that the boron to calcium ratio in the CaCO₃ shells of bottom dwelling open ocean foraminifera are tightly correlated with the extent of carbonate ion undersaturation. At Lamont-Doherty Earth Observatory of Columbia University, he is using this method to reconstruct the evolution of deep ocean carbonate ion concentration from the glacial maximum (~25 kyrs ago) to present. His goal is to evaluate the role of deep ocean chemistry in the rise of atmospheric CO₂ content at the close of the last glacial period.
- Xianfeng Wang. As part of his Ph.D. research at the University of Minnesota, he created an 18O record for stalagmites in Brazil and showed that millennial duration fluctuations in monsoon rainfall were exactly antiphased with those in China. At Lamont-Doherty Earth Observatory, he is continuing this research but is also diversifying his efforts by measuring the concentrations of ²³⁴U, ²³⁰Th, ²³¹Pa and ¹⁰Be in sediments from the abyssal ocean. In so doing, he is following up on research done by Richard Ku in the 1970s with modern instrumentation.

- Irene Schimmelpfennig. She did her Ph.D. research in France on the production rate of ^{36}Cl in separated minerals. On April 6, 2010, she joined Joerg Schaefer's group at Lamont-Doherty Earth Observatory to pursue the use of ^{36}Cl and ^{10}Be in what is termed "cosmic-ray exposure dating".

Publication:

- Jimin Yu, Gavin L. Foster, Henry Elderfield, Wallace S. Broecker and Elizabeth Clark, *An evaluation of benthic foraminiferal B/Ca and $\delta^{13}\text{C}$ for deep ocean carbonate ion and pH reconstructions*, "Earth and Planetary Science Letters", 293, 2010, pp. 114-120.

Statement by the Prizewinner: *I have decided to accept personally only ten percent of the award and to donate the other ninety percent to the Comer Science and Education Foundation. The Foundation's executive officer has to this end created a separate fund named the Global Climate Change Research Foundation to house this donation. It will be spent for small research grants focused on several key areas that I deem important to our understanding of the consequence of the ongoing global warming created by the release of CO_2 generated by the burning of fossil fuels.* Wallace Broecker (Rome, 21.11.2008)