Constraining current oceanic nitrous oxide (N_2O) Emissions and reducing uncertainty for future emissions

L.M. ZAMORA[1]*, A. KOCK[1], A. OSCHLIES[1] AND H.W. BANGE[1]

[1]GEOMAR Helmholtz Centre for Ocean Research Kiel, 24105 Kiel, Germany (*correspondence: lzamora@geomar.de)

N_2O is the third most important greenhouse gas, and the 2007 IPCC estimated that oceans provide 10-30% of annual N_2O flux to the atmosphere [1]. The large range in previously estimated oceanic emissions is primarily due to uncertainties in parametrizing microbial N_2O production and consumption within the ocean and to spottiness of data coverage. Here we better constrain ocean N_2O fluxes to the atmosphere by using a complementary dual data-based and modeling approach. First, we estimate current day emissions from the new MEMENTO database, in which gaps in ocean N_2O data coverage have been improved from previous studies [2]. We find oceanic emissions at ~8.6 Tg N_2O yr^{-1}, which falls into the higher end of the 2007 IPCC estimate of 2.8-9.1 Tg N_2O yr^{-1} emitted from the ocean [1]. Our estimate falls on the high-end of previous estimates primarily due to better data coverage in oceanic N_2O emission hotspots.

The new atmospheric N_2O fluxes from the MEMENTO database gives us valuable insight into the importance of oceanic N_2O emissions. However, improved estimates of the fluxes alone will not allow predictive capacity for future marine N_2O emissions. Therefore, we use the improved present-day emissions estimate calculated here to constrain N_2O parameterizations for a marine biogeochemical model. The marine biogeochemical model incorporates the ranges of literature uncertainties in N_2O biological production and consumption and provides the associated N_2O emissions. Given the known range in current-day fluxes, we are now able to better constrain some of the uncertainties in biogeochemical model parameterizations, thereby enabling a better predictive capacity for future N_2O emissions from the oceans.

[1] Denman *et al*. (2007) *in* 4th IPCC report, Cambridge Univ. Press. [2] Nevison *et al*. (1995) *J. Geophys. Res.* **100**, 15809-15820.

Tephrostratigraphy and tephrochronology of the Last 130 Ka in the Mediterranean Basin for synchronizing past climatic events

G. ZANCHETTA[1]

[1]Dipartimento di Scienze della Terra, University of Pisa, Via S.Maria 53, 56126, Pisa, Italy (*correspondance: zanchetta@dst.unipi.it)

With the explosion of palaeoclimatic and palaeoenvironmental research following the concerns related to global warming, few volcanologists could have imagined their role to have changed so dramatically from their traditional focus. In the last two decades, this sector of the scientific community was compelled to move towards a tighter link with Quaternarists, geomorphologists, archaeologists, palaeoceanographers and more in general palaeoclimatologists. Tephrostratigraphy and the identification of tephra layers in different archives will become a mandatory request of many projects for synchronizing archives and improving chronological control of palaeoclimatological records.

The Mediterranean basin is probably one of the most significant areas globally where tephrostratigraphy can reveal its full potential and benefit different disciplines, due to the very large number of explosive volcanoes with very distinctive geochemistries. However, for the correct identification and separation of the different tephra events on distal archives, detailed micro-analytical work is necessary, in some cases including trace elements and observations of peculiar mineralogical associations along with stratigraphic information. Now well dated, chemically well characterized and widely dispersed tephra layers allow us to propose very detailed reconstruction of succession of climatic events for the last 130 ka.

DOI:10.1180/minmag.2013.077.5.26