Geophysical Research Abstracts
Vol. 12, EGU2010-5948, 2010
EGU General Assembly 2010

Late Miocene terrestrial record of East Antarctic Ice Sheet configuration and dynamics recorded by volcanic lithofacies and sequence characteristics in northern Victoria Land, Antarctica

John Smellie (1,2), Sergio Rocchi (3), Maurizio Gemelli (3), Gianfranco di Vincenzo (4), and Pietro Armienti (3)

(1) Department of Geology, University of Leicester, Leicester, UK (jls55@le.ac.uk), (2) British Antarctic Survey, Cambridge, UK , (3) Dipartimento di Scienze della Terra, Università di Pisa, Pisa, Italy (rocchi@dst.unipi.it; gemelli@dst.unipi.it; armienti@dst.unipi.it), (4) Istituto di Geoscienze e Georisorse, Consiglio Nazionale delle Richerche, Pisa, Italy (g.divincenzo@igg.cnr.it)

Late Miocene (c. 12-5 Ma) volcanic sequences crop out extensively along > 250 km of northern Victoria Land coastline, at the Ross Sea margin of the East Antarctic Ice Sheet (EAIS). The sequences are dominantly glaciovolcanic and two main types are present. The commonest and most representative comprises multiple mafic aa lava-fed deltas, a type of glaciovolcanic sequence not previously described. The second sequence type resembles mafic glaciovolcanic sheet-like sequences of Mt Pinafore type (sensu Smellie, 2006, Earth-Science Reviews, 74, 241-268) but includes felsic examples as well, and there are additional minor occurrences of pyroclastic cones and an ice-marginal lacustrine deposit. Interpretation of the glaciovolcanic sequences enables estimates of past ice thicknesses that were coeval with eruptions to be made with considerable certainty. The sequences were formed in association with a glacial cover that was typically, and probably never much more than, a few hundred metres thick. Despite gaps in the record, no evidence was observed for subaerial (i.e. fully ice-free) eruptive conditions, suggesting either that ice-free conditions did not occur or else were of such short duration that they left no record. These observations are consistent with the presence of a late Miocene ice dome or regional ice sheet situated in northern Victoria Land for the period, although it may have been confluent with the EAIS similar to conditions present today. The basal glacial thermal regime varied from wet-based and dynamic, to cold-based (frozen to its bed) and presumably relatively stable. A major change from wet-based ice to cold-based ice is evident but its timing is not precisely determined. There is also evidence that temporary changes in thermal regime might have occurred before and after the principal transition.