Episodes of gas hydrate dissociation and enhanced methane flux recorded by methane-derived authigenic carbonates in the Gulf of Cadiz

V.H. MAGALHAES* AND L.M. PINHEIRO

Centre for Environmental and Marine Studies (CESAM) and Geosciences Department, Univ. Aveiro, Campus de Santiago, 3810-193 Aveiro, Portugal (*correspondence: vhm@ua.pt)

Extensive occurrences of mud volcanoes, diapiric ridges, pockmarks and methane seepages in the Gulf of Cadiz, often fault controlled, are characterized by high methane contents in the shallow sediments and by the presence of gas hydrates on the most active structures, indicating that these are preferential pathways for the escape of hydrocarbon-rich deep fluids (mainly methane). Methane-derived authigenic carbonates (MDAC) are found associated with mud volcanoes, diapiric ridges or along faults, mainly along the upper and mid-continental slope, where the Mediterranean Outflow (MO) water is in direct contact with the seafloor.

Two distinct groups of MDAC are found in the Gulf of Cadiz: one consisting of dolomite crusts, nodules and chimneys, and the other of aragonite pavements, slabs, crusts and buildups. The widespread abundance of MDAC is interpreted as evidence of several episodes of extensive methane seepage. Considering the minimum and maximum temperature limits admitted to have occurred in the Gulf of Cadiz, some MDAC samples indicate a formation from ^{18}O-enriched pore fluids that could have resulted from a contribution of dissociated gas hydrates to the pore waters from which the authigenic carbonates were formed. The estimated U/Th ages of selected dolomite chimneys indicate episodes of intense precipitation of the authigenic carbonates, that correlate with periods of rapid paleoceanographic changes, such as the onsets of glacial/interglacial terminations.

Calculations for the depth of the gas hydrate stability zone for different paleoceanographic scenarios indicate that increases in the seafloor temperature associated with glacial to interglacial transitions and changes of the position of the MO as a bottom current, could efficiently trigger episodes of gas hydrates dissociation that would result in intense flux of methane rich fluids to shallow sediments or even into the seabottom.

Aerosol transformation and scavenging in stratocumulus clouds

LEEHI MAGARTTZ, ALEXANDER KHAIN AND MARK PINSKY

Department of the atmospheric Sciences, The Hebrew University of Jerusalem, Israel (khain@vms.huji.ac.il)

A novel Lagrangian model of straocumulus cloud is used for investigation of transformation of aerosol size distribution and aerosol removal from the boundary layer covered by a startocumulus clouds. The moldel consists of about 1500 lagrangian parcels that move within a turbulent –like flow which statistical parameters are taken from observations. The model takes into account processes of diffusion growth, collisions, droplet scavenging and mixing between parcels.

The stratocumulus clouds observed during research flights RF01 and Rf07 of the field experiment DYCOMS-II are simulated.

The model described diffusion growth of wet aerosols to drops and back to wet aerosols during droplet evaporation. The amount of aereosols in each bin of aerosl/drop size distribution is calculated at each time step. It is shown that aerosols within drops grow by collisions, so that drizzle contains largest aerosols. The rate of aerosol scavenging by drizzle is evaluated. The salinity of drops of different size is calculated. The evaluated rate of aereosol scavenging can be used for estimation of necessry rate of aerosol production in the atmosphere (assuming the balance of the aerosol mass in the atmosphere).