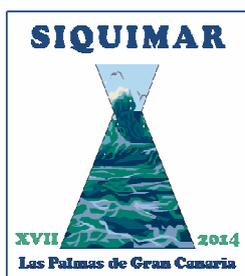




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Geological Oceanography

Geomorphological characteristics of Pipoca mud volcano linked to recent geological processes in the Gulf of Cadiz continental margin

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Abstract

Mud volcanoes are conical edifices formed by the vertical migration of muddy sediments and fluids (hydrocarbons and brines) that are extruded by successive emissions. Mud breccia is the distinctive material of these volcanoes which is composed by clasts of varied lithologies embedded in a clayey matrix. This material is pushed out by the central diatrema of the cone and gives rise to mud flows that slide down the flanks of the edifice. These volcanoes are very common in the middle and upper slope of the Gulf of Cadiz. They are placed over buried diapiric structures and are associated to faults that facilitate the fluid escape (Fernández-Puga et al. 2007). The aim of this communication is to study the seafloor morphology and the sub-superficial characteristics of the Pipoca mud volcano, its interaction with the water masses hydrodynamic and the recent geological processes (tectonics, sedimentary, diapirism) that have occurred in the zone. This work has been developed in the framework of the LIFE+ INDEMARES/CHICA Project.

It has been analyzed data obtained during the oceanographic cruise INDEMARES/CHICA0412 onboard R/V "Ramón Margalef" that was carried out in the area named Shallow Field of Fluids Expulsion (SFFE) in the middle slope of the continental margin of the Gulf of Cadiz. The acquired information comprised: bathymetric data from a Kongsberg Simrad EM-710 multibeam echosounder (70 to 100kHz); and a very high-resolution seismic system TOPAS PS018, working with a primary frequency from 16 to 20kHz and a secondary frequency ranging from 0,5 to 4 kHz.

The Pipoca mud volcano is situated in the SFFE, to the west of the Guadalquivir diapiric ridge and to the north of Huelva channel (Hernández-Molina et al. 2006). It shows a sub-conical shape with an elliptic base as an ENE-WSW direction. The major semiaxis has a length of 2.89 km and the minor semiaxis of 1.1 km. The summit is dome shaped and is located at 503m water depth. A large mud flow is observed from the summit to 762 m water depth crossing the volcano southwestward and interrupting the Huelva channel. On the mud flow surface, six superimposed lobes have been mapped indicating that the venting processes and the formation of mud flows have took place in different stages. To the SE, it is characterized by a plastered contouritic deposits that ascend the volcano flank. Very high-resolution seismic profiles reveal chaotic-to-transparent units with faults that break the contouritic deposits and are interpreted as slides. Some slide scars can be seen in the contourite-volcano limit. The slides have been occurred in different episodes and the deposits are buried between sediment layers of sub-parallel reflectors. Two large depressions, with areas of 2 and 5 km² respectively, are located to the north and northwest of the volcano. They have a sub-circular plan view shape and their edges show approximately vertical walls that end on a low-gradient flat bottom surfaces. The bottom of the depressions is slightly tilted to the NNE, where both reach the maximum depth, and parallel reflectors are observed which appear abruptly truncated in the very high-resolution seismic profiles.

In this sector of the Gulf of Cadiz, the Mediterranean Outflow Water (MOW) flows with the same direction SE-NW as the Huelva channel (Hernández-Molina, et al., 2006) reaching current velocities that

range between 0,20 and 0,40 m/s at the southeastern flank of the Pipoca mud volcano and between 0,10 and 0,20 m/s in the northwestern depression zone (Fernández-Salas et al. 2012). The interaction of the current with the volcanic edifice generates an increase of the erosion in the southeastern zone of its base. It could be the trigger mechanism of mass transport processes observed in this zone. These mass transport deposits appear buried and intercalated with units of subparallel reflectors of contouritic deposits. Plastered contouritic deposits, possibly generated by the currents, are therefore emplaced over old mass transport deposits giving rise to a low slope surface. Whereas in the NW zone, there is a countercurrent generating eddies and vortex with minor speed intensity. In this zone, the two main depressions are generated by the non-consistency of the sediments related to the lack of interstitial fluids and the presence of normal faults which drive the fluid migration could produce also the collapse of the surface. The elongated shape of the eastward depression could be also explained by a major influence of the erosion by currents that are favored by eddies and vortex of the MOW. Besides, slide generated deposits have been observed along the walls of the depressions that would be also a consequence of this current effect. In the southeastern flank of Pipoca dense crinoid beds of mediterranean affinity (*Leptometra phalangium*) occur due to the nature of the water mass (MOW) and also the stronger currents that favour the availability of particles for these suspension feeders that are indicative of productive waters.

References

- Fernández Salas, L.M., R. Sánchez Leal, J.L. Rueda, N. López González, V. Díaz del Río, F.J. López Rodríguez, G. Bruque, J.T. Vázquez, 2012. Interacción entre las masas de agua, los relieves submarinos y la distribución de especies bentónicas en el talud continental del Golfo de Cádiz Geo-Temas 13: 198.
- Fernández-Puga, M.C., Vázquez, J.T., Somoza, L., Díaz del Río, V., Medialdea, T., Mata, M.P., León, R. 2007. Gas related morphologies and diapirism in the Gulf of Cadiz. Geo-Marine Letters, 27: 213-221.
- Hernández-Molina, F. J.; Llave, E.; Stow, D.A.V.; García, M.; Somoza, L.; Vázquez, J.T.; Lobo, F.; Maestro, A.; Díaz del Río, V.; León, R. ; Medialdea, T. and Gardner, J. 2006. The Contourite Depositional System of the Gulf of Cadiz: a sedimentary model related to the bottom current activity of the Mediterranean Outflow Water and the continental margin characteristics. Deep Sea Research II, 53: 1420-1463.