



# Walking among deep-sea carbonate mounds

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In the afternoon of Thursday 27 October 2011, a fleet of seven 4WD vehicles cruising off-road in the eastern Anti-Atlas Mountains of Morocco reached the Hamar Laghdad range. In amazement, some 30 Moroccan and European marine carbonate system researchers set foot on a pristine, 400 million year old seafloor, carbonate mounds towering 20 to 30m high around them like natural pyramids. For the HERMIONE scientists, the Pen Duick Escarpment off Larache came alive. Tens of thousands of years of sand blasting has delicately removed the petrified muds that had draped the amazing carbonate world of the Devonian seas. While heated discussions had dominated the early part of the day, the junior and senior scientists were speechless as they walked among the mounds, touched their flanks, climbed their peaks, overlooking an astonishing seascape as the sky glowed red: as the sun set, a sand storm started up, as if the desert wished to recover its secrets. None of us understood how the drivers managed to navigate to our desert lodge, a 30 km off-road night drive with a visibility of a few meters.



Above: The road to the Hamar Laghdad mounds

The next morning, after a briefing on the flanks of the golden dunes of Merzouga, our party decided to head for the Carboniferous mounds of Hammou Ghanem, close to the Algerian border. Under the discrete protection of a heavily-armed police escort, our team experienced once more the very same excitement. This time, mound ranges of the Porcupine Seabight came to life: totally different actors, remarkably similar plays, over hundreds of millions of years. The magic works again. Later in the evening, seated around a rich Moroccan table, the scientists were unanimous: this is world heritage.



Above: The COCARDE field party walking among the mounds.

Developing mound heritage routes for science and capacity building is one of the objectives of COCARDE, which stands for Cold-Water Carbonate Reservoir Systems in Deep Environments. Born out of EC and ESF-sponsored research projects focusing on cold-water corals and carbonate mounds, COCARDE navigates from the recent to the deep past to better grasp the fundamental processes of carbonate build-up – how Life builds Geology. On its way through geological time, COCARDE meets with industry, which taps giant hydrocarbon reservoirs in similar fossil carbonate systems. COCARDE develops as a curiosity- and exploration driven project, with its roots in extreme environments and a focus on processes. While walking on the mounds, it opens up to frontier research in carbonate systems – any temperature, any depth, any actors, marine and lacustrine.

The strength of the operational structure of COCARDE lies in its distributed management. The network activities wax and wane with multiple resources, while keeping tack. The 2011 Morocco workshop and field seminar was co-funded by COCARDE-International Coordination Action (FWO Flanders, IOC-UNESCO) and COCARDE-European Research Network. The latter ESF network (2011-2016) is supported by Switzerland, Germany, The Netherlands, Belgium, Denmark and Italy. However, it is an open network, and other countries with significant carbonate research are most welcome to join.

