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The Makran accretionary complex off Pakistan : insights from the “CHAMAK” cruise

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During autumn of 2004, we have investigated the Makran accretionary prism offshore Pakistan during the CHAMAK cruise onboard R/V “Marion Dufresne”, using multi-beam bathymetry, seismics and long cores. As a main result of the cruise, we show that the taper of the prism is not constant along strike and that the deformation front is thus heterogeneous. It can be related to a peculiarity of this eastern part of the Makran subduction complex which is the presence of large northeast bathymetric ridges in the downgoing plate. The main relief of the eastern Arabian Sea, known as the Murray Ridge, is a trans-tensional structure related to the Owen fracture Zone (the boundary between the Arabian and Indian plates). Although this structure is not under-thrusting the accretionary prism yet, it controls the shape of the subduction trench and thus the thickness of the offscraped sequence. We interpret the apparent upslope migration of abandoned meandering channels probably related to the Indus delta system as the consequence of a rapid tectonic tilt of the northern Murray Ridge.

A smaller basement ridge located landward of the Murray ridge is called the “Little Murray Ridge”. It is presently under-thrusting the accretionary complex, causing a major change in the taper angle as well as a general uplift of this part of the prism. Finally, we can also relate the along-strike variations of the abundance of slump scars to a variation of the erosion rate controlled by the under-thrusting of the basement topography.