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Giant submarine landslides off NW-Africa

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The passive continental margin off Northwest Africa is dominated by high terrigenous sediment input (fluvial and aeolian) and high primary production in upwelling areas. The redeposition of these sediments is controlled by both gravitational and bottom current induced along slope sediment transport. Some sections of the margin show repeated instabilities, while other regions are stable for a long time. Two prominent examples for large scale landslides are the Dakar Slide offshore Senegal and Sahara Slide offshore West-Sahara.
High resolution seismic and hydro-acoustic data acquired during Cruise MSM11/2 in spring 2009 in addition to data from cruise M65/2 in 2005 reveal an giant submarine slide offshore Senegal named Dakar Slide. The slide shows a headwall with a length of at least 90km along slope in between water depths of 3.100 to 3.400m. The slide is confined by the Dakar Canyon in the north and the Diola Canyon in the south. The northern sidewall runs for 90 km into the deep-sea where it crosses the distal part of the Dakar Canyon. Seismic data show that the distal part of the Canyon was repeatedly destroyed and filled by slide deposits. Erosion structures in former canyon fill shows reactivation of the Canyon in the past. The area above the slide does not show major mass-wasting events even though the slope gradient there with 3° is steeper than the slope angle of 0.5-1° in the headwall region of the slide. Beneath the northern headwall and sidewall of the Dakar Slide the seismic data show a large scale wavy sediment structure, which covers at least 400 km^2 and is up to 1km thick. The crests of the waves strike in an along slope direction, and we interpret this feature as listric faults, which might have originated from creeping prior to the main catastrophic failure event. Furthermore upslope of this area between 1.300 and 2.000 meters bathymetric and high resolution seismic data show additional signs for (active/recent) creeping in the form of down slope orientated bulges. Until now, however, it is unclear if there is a relation between the creeping and the slope failure. The Dakar and the Diola Canyon seem to limit the slide to this area and therefore restrict the expansion of the slide further along the slope. As indicated by the repeated slide deposits filling the Dakar Canyon and the abundance of deeper lying chaotic to transparent sediment structures in the seismic data, mass-wasting events prior to Dakar Slide were common.
Seismic data from cruise M58/1 in 2003 and new bathymetric data of the headwall area of the Sahara-Slide also collected during Cruise MSM11/2 show a mega slide with a length of ∼700km and an estimated volume of ∼600km. The age of the main slide event is 50-60ka. The distal part of this slide complex is well studied, while data in the source-area are sparse. Available data of the source area indicate vertically stacked slide deposits and a relatively recent reactivation of the headwall. To investigate this observation in more detail additional data will be acquired during the upcoming Poseidon P395 Cruise in February 2010.