



Submarine landslide geohazards from Oceanic Core Complexes

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Oceanic core complexes (OCCs) form at slow spreading mid-ocean ridges by tectonic stretching and exhumation of the mantle at the footwall of long-lived, low-angle detachment faults. They are usually dome-shaped edifices that display considerable topographic relief relative to the surrounding seafloor. Seafloor mapping during the TOSCA expedition (Tectonic Ocean Spreading at the Charlie Gibbs Fracture Zone) revealed the presence of at least four OCCs of up to 4000m height, marked by very high, up to 1000m, scarps. The OCCs are found on either side of the spreading centre, within the narrow zone between the two transform faults that create the Charlie Gibbs Fracture Zone. Remotely operated vehicle video and sampling dives show the composition of the edifices to be made primarily of gabbro, dolerite, and serpentinite but also hartzburgite and lherzolite. The scarps are characterised of near-vertical walls of exposed rock, dissected by fractures. Extensive boulder fields occupy the areas at the foot of the scarps. Angular blocks of various sizes and up to a few metres across are piled in the proximal to the scarps areas of the boulder fields. Seismic imaging in the basins of the two transform faults reveal that the infill of these basins does not contain the expected amount of mass transport deposits relative to the large-scale mass wasting that characterises the edifices. We hypothesise that the edifices are subject to serpentinisation that primarily occurs within the fractures, a process that severely weakens the internal structure of the OCCs and subjects them to gravity-driven flank collapses. This would imply that the older the OCC the more weathering it will have undergone and, as a result, the more liable it will be to flank collapses. This process would obliterate OCCs that are no longer in an active building phase. We believe that the dominant type of failure is rock avalanches that do not have high mobility and therefore rarely reach the basins that appear to be mainly infilled by sediments. Ongoing work will consider the fracture network, the role of serpentinisation in rock-mass weakening, the scale of each flank collapse, and the tsunami-hazard posed to the coastlines that surround the North Atlantic.