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Shallow gas escape as environmental hazard: Rande slide in Ría de Vigo (NW Spain)

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The Galician Rías are located in the NW of the Iberian Plate on the eastern passive Atlantic margin. The main morphological aspect of this coast is the presence of several encased-valleys named Rías Baixas. Basement in the region of the rias is composed of Paleozoic metamorphic and igneous rocks fractured by NE-SW, NW-SE and N-S faults. The morphology of the rias is a combination of both with faulting being responsible for local and regional uplifts-subsidence and erosion along these fractures. This tectonic scheme is similar to the model proposed for the Galician margin during the Mesozoic rifting. The rias are probably a product of Paleozoic faults reactivation during the Alpine Orogeny. Recent seismic activity has been documented in this region denoting that tectonic activity can continues in the rias (neotectonism?). The tectonic-eustatic processes controlled the evolution and deposition of the ria's sediment fill. In fact, the rias are acting as traps of sediments from the Last Glacial Maximum regression (LGM, aprox. 18ky). Geomorphological and oceanographical conditions are main factors controlling sedimentary facies distribution during the Holocene. The Ría de Vigo is a natural laboratory for shallow gas representing a small scale marine basin with less than 50m water depth and where upwelling processes occur seasonally. Extensive Holocene mud rich in organic matter (up to 14% content) are deposited mainly along its axis and inner San Simón Bay.

Here we report different seabed features induced by the presence of shallow gas accumulation and/or escapes found in Ría de Vigo. A small scale slide has been identified for a first time in very high resolution seismic record (3.5 kHz) at Rande Strait. Rande Strait is a tectonic step, 600m wide connecting the innermost and shallowest San Simón Bay with the rest of the Ría. This bay is 7m average water depth with 0.1% seabed slope whilst Rande Strait shows 2% seabed slope reaching up to 25m

water depth at its distal part. In seismic records the slide appears as a package with chaotic seismic facies bounded at the bottom by a high reflectivity reflector which shows continuity with p.s.b. in both, upper and lower Rande slope. This deposit can be following along 600m down-slope and ranges from 0.8m thick at its beginning to 2m at its distal part. Subbottom profiler records allow identifying a very shallow gas accumulation (60cm below p.s.b.) underlying the slide. The edge area of San Simón Bay, flanking the beginning of the slide, is characterized by a high density of seeps and pockmarks, 80 and 25 targets in 16 km high resolution profiles respectively. The pockmarks have average dimensions of 15m diameter and 1m depth showing active gas escaping frequently. This seeping area covers two square kilometer surface with water depths ranging from 5m to 12m where gravity cores exhibit 3 m of muddy facies.

The regional fault systems are responsible for both, Rande Strait seabed stepping and San Simón Bay existence. Seismic activity is a main activating mechanism for slides in many margins and Rande Strait slide could be developed under similar circumstances. Nevertheless, instability due to shallow gas escape is proposed as a more probable alternative explanation.