

# From shelf to abyss:

## Morphology of the Avilés submarine canyon, Northern Iberian margin

Galderic Lastras<sup>1</sup>, Miquel Canals<sup>1</sup>, Aaron Micallef<sup>1,2</sup> and the COCAN Shipboard Party<sup>3</sup>

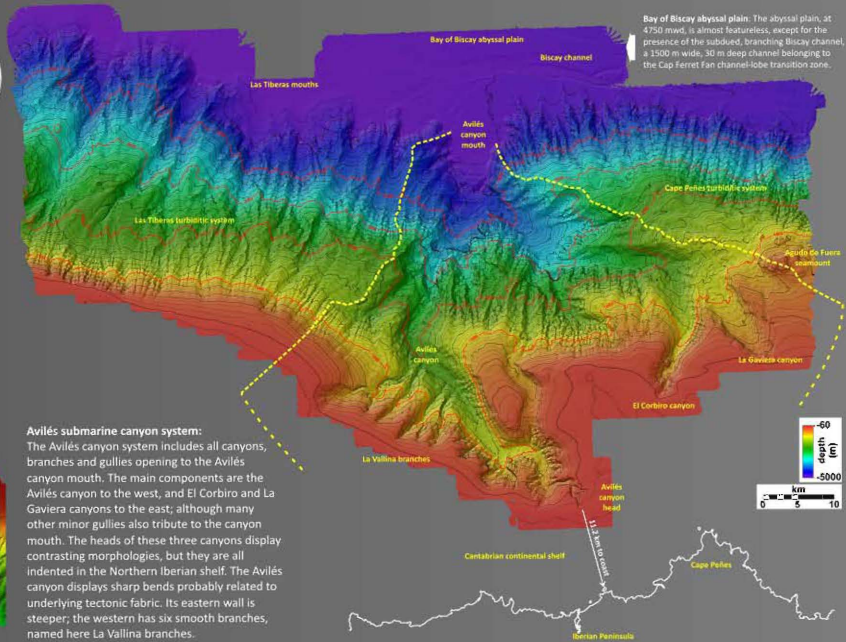
<sup>1</sup>GRC Geociències Marines, Universitat de Barcelona, Catalonia; <sup>2</sup>University of Malta, Msida, Malta;

<sup>3</sup>D. Amblas, A.M. Calafat, R. Durán, A. Muñoz, R. Pedrosa-Pàmies, A. Sanchez-Vidal, X. Rayo, A. Rumín, X. Tubau, O. Veres

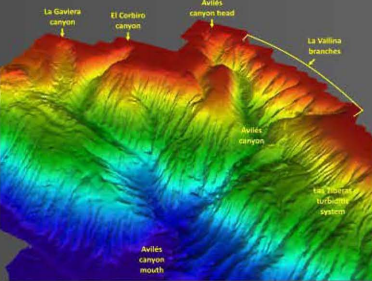


During the COCAN survey onboard S/O Miguel Oliver (October–November 2011), 5682 km<sup>2</sup> of the Cantabrian margin around the Avilés canyon, Southern Bay of Biscay, were swath-mapped. The aim of the survey was to characterize with the highest resolution possible the seabed morphology of the canyon from its head down to the abyssal plain, and of the adjacent slopes.

Data were obtained with a Simrad EM302D multibeam echosounder, operated in equidistant mode with swath widths between 600 m in the shelf and 6000 m in the abyssal plain and processed onboard using Caris HIPS and SIPS software, resulting in a general 20-m-grid-size DTM.

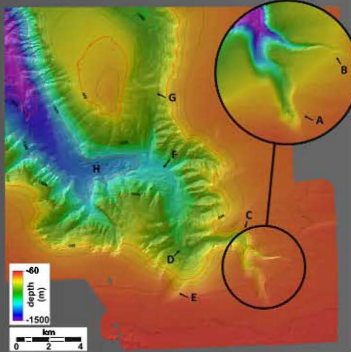


Bay of Biscay abyssal plain: The abyssal plain, at 4750 mwd, is almost featureless, except for the presence of the sub-parallel, branching Biscay channel, a 1500 m wide, 30 m deep channel belonging to the Cap Ferret Fan channel-lobe transition zone.



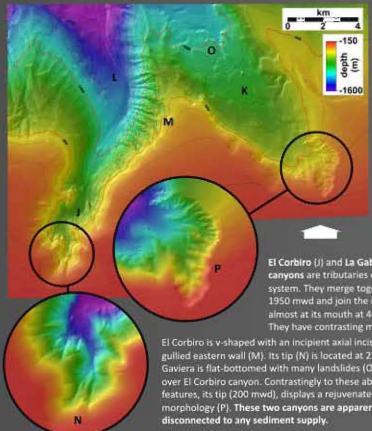
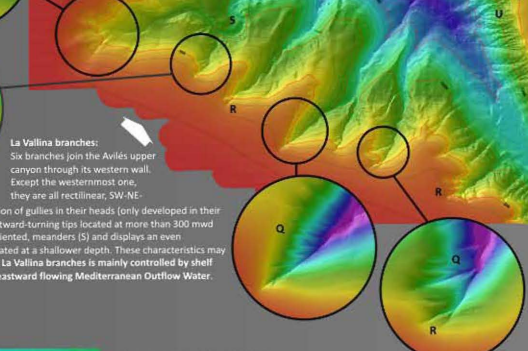
**Avilés submarine canyon system:** The Avilés canyon system includes all canyons, branches and gullies opening to the Avilés canyon mouth. The main components are the Avilés canyon to the west, and El Corbizo and La Gaviera canyons to the east; although many other minor gullies also tribute to the canyon mouth. The heads of these three canyons display contrasting morphologies, but they are all indented in the Northern Iberian shelf. The Avilés canyon displays sharp bends probably related to underlying tectonic fabric. Its eastern wall is steeper; the western has six smooth branches, named here La Vallina branches.

The Avilés canyon head: Its shallowest tip (130 mwd) corresponds to the S-N oriented branch (A). 11 km from the coast. A second branch (B) joins the canyon axis at 330 mwd. Two sharp bends (C and D) occur before the floor widens to 1 km and starts receiving small gullies and a wide, round-shaped entrant (E). A third bend to the west (F) marks the place where a N-S oriented, double-vergent gully (G) joins the canyon. A fourth bend (H) to the NW at 1180 mwd is considered the limit between the head and the upper canyon. These successive sharp bends indicate that this section is most probably tectonically-shaped, and only active during lowstands when connected to river input.

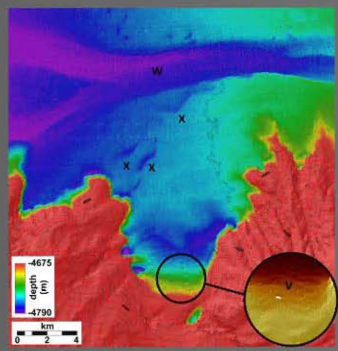


**La Vallina branches:** Six branches join the Avilés upper canyon through its western wall. Except the westernmost one, they are all rectilinear, SW-NE-

oriented with an asymmetric distribution of gullies in their heads (only developed in their western walls, Q), and with their westward-turning tips located at more than 300 mwd (R). The westernmost branch, W-E-oriented, meanders (S) and displays an even distribution of gullies (T) in its tip, located at a shallower depth. These characteristics may be indicative that the morphology of La Vallina branches is mainly controlled by shelf sediment supply and the dominant eastward flowing Mediterranean Outflow Water.



**El Corbizo (J) and La Gaviera (K) canyons** are tributaries of the Avilés system. They merge together at 1950 mwd and join the main canyon almost at its mouth at 4400 mwd. They have contrasting morphologies: El Corbizo is v-shaped with an incipient axial incision (L) and a gullied eastern wall (M). Its tip (N) is located at 250 mwd. La Gaviera is flat-bottomed with many landslides (O) and hangs over El Corbizo canyon. Contrastingly to these abandoned-like features, its tip (200 mwd), displays a rejuvenated morphology (P). These two canyons are apparently disconnected to any sediment supply.



The lower Avilés canyon lacks the continuity of the upper section. Half a dozen of over-erosion ponds interrupt the wide canyon floor, as well as up to 350 m high landslide scars. One of them cuts the axis at 2700 mwd and affects the whole canyon from wall to wall.

**The Avilés canyon mouth:** All the system drains to the Avilés canyon mouth, which opens to the Bay of Biscay abyssal plain at 4750 mwd. Except for very faint sediment waves (V), no other typical bedform is visible. The system is apparently unconnected to the E-W-oriented Biscay channel (W), although transverse scars (X) may be related either to Avilés canyon or to overspill of the southern levée of the Biscay channel.

The 4750-mwd-mouth is located within a stone's throw from the 130-mwd-canyon head tip: from shelf to abysses in 50 km.

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