Assessing sedimentary response of shallow- and deep-marine depositional systems developed in tectonically controlled elongate basins, based on outcrop and subsurface data

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Background: The presence and distribution of reservoirs are key risks in exploration due to the limited amount of data and direct observations. Recent geological studies and geophysical investigations have pointed out as structurally controlled mini-basins, block-faulted compartments or narrow marine seaways can generate unpredictable and/or different sediment routings in association with variable accommodation as they fill (Fig. 1; Hernández-Molina et al., 2014a; 2016; Rebesco et al., 2014; Chiarella and Longhitano, 2016; Longhitano and Steel, 2016; Capella et al., 2016; Rossi et al., in review). In such settings, both oceanographic processes (e.g., tides, waves, currents, etc.) and morphological constraints can result in sedimentation that departs from classical depositional models and widely known stratigraphic schemes. Consequently, analysis of such settings in the subsurface is often problematic, affecting predictions quality on hydrocarbon reservoir characterisations, enhanced recovery projects or identification of new plays (Stow et al., 2013; Capella et al., 2016). However, these resultant uncertainties can be reduced by comparison with appropriate outcrop and subsurface analogues, and based on the comprehension of the primary sedimentary processes that acted at the time of basin infilling.

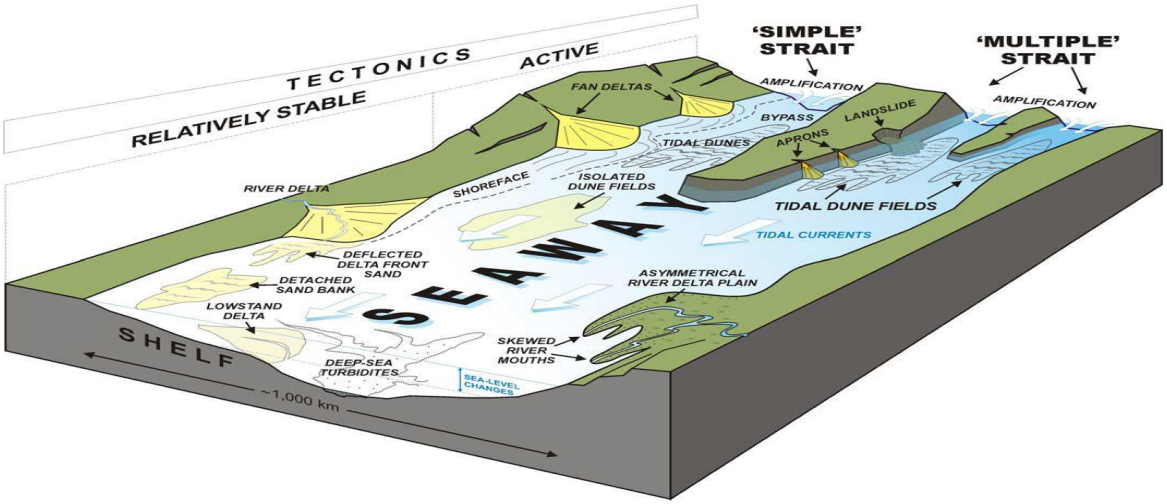

Figure 1 – Schematic representation of tectonically controlled elongate basins (modified after Longhitano and Steel, 2016)

Approach: The aim of the project is to investigate Neogene-to-Quaternary successions cropping out in the Mediterranean area (Fig. 2) and subsurface examples, pointing to assess how marginal- to deep-water sedimentary systems respond to structurally-confined, narrow settings. The Mediterranean area offers a wide number of very well preserved and spectacularly exposed successions that can be analysed by means of a lithostratigraphic and sedimentological approach and that can be used as analogues for many very similar hydrocarbon reservoir case studies. Selected outcrops commonly consist of continental, marginal-marine and deep-water sedimentary systems (i.e., alluvial fans, river

deltas, shorefaces, current-dominated straits and deep-water deposits), very well accessible and with different observation viewpoints. If properly investigated, these successions can provide information to better constrain modelling of a number of hydrocarbon plays of the United Kingdom, Norwegian or the Gulf of Cadiz continental margins, which developed in analogous tectono-sedimentary settings.

Figure 2 –Tectonically-controlled basins at the early Pleistocene time and presently exposed in southern Italy (modified after Longhitano and Steel, 2016).

Training and career routes: The student will join an international research workgroup that integrates sedimentology, stratigraphy, recent tectonic and marine geology for a basin analysis both in onshore and offshore areas, and which has a strong track record in applying these disciplines to hydrocarbon exploration and production. In addition, all supervisors have long experience studying outcrop and subsurface datasets based on modern and ancient depositional environments (e.g. Chiarella and Longhitano, 2012; Longhitano et al., 2014; Hernández-Molina et al., 2014; 2016). In particular, DC has deep experience in subsurface exploration and production, having worked in the last five years in the Norwegian oil upstream. The candidate will have the opportunity to integrate field- or subsurface-based datasets with numerical modelling and industry-standard E&P software methodologies thanks to a wide network of international co-operators. Likely career paths include research specialist (in industry or academia), or exploration and reservoir geologist.

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