Transform/oblique rift system: what have we learned from numerical modelling and what's next?

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For very long time, transform margins have been treated and described based on oceanic transform fault concepts. Their was no change in kinematics nor structures with time and thermally speaking, it was hypothesized that the margin was reheated as the mid-oceanic ridge translated passively along the margin. In the last 10 years, 3D numerical modelling has been made available and numbers of studies have challenged this view. It is time to review the concepts that have emerge. Interestingly, many modelling contributions have tackled the obliquity at very different scales, with initial conditions varying from simple flat layered homogeneous lithosphere to subduction of opposite vergence. Moreover some contributions have focus on rheological aspect and other on inheritance at different scale and different physical coupling have been used. Some models were targeting at reproducing the oceanic transform concepts, other at exploring how large scale structure can emerge. I will therefore try to review the state of art in numerical modelling of transform margin and oblique extensional system based on my own work and literature review. I will try to emphize the important differences and similarities used in the different modelling. Using different models with different boundary conditions and scale I will try to introduce a new conceptual model of transform margin which captures important characteristics like the delay in continental break-up highlighted by the tracing of sediments and water-depth as well as the obliquity between syn-rift and post-rift subsidence. Some models of oblique extension have also been producing new type of strike slip ocean continent transition which somehow could be interpreted as steep transform margins but appears to be mainly strike slip and have no conjugate margins. To conclude, all these 3D numerical modelling allow us today to present a very different view of transform margins than 10 years ago. Some of the new concepts that have emerged mandate to reassess our interpretation of existing datasets.