Microcontinent Formation in a Mantle Plume and Plate Tectonic Perspective

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Continental extension and separation can in general be described by a pole of rotation and an un-zipping of the continents. However, when significant melt production form during the late rifting stage, it seems to influence and favour a sudden onset of breakup over thousands of km, leaving significant along axis differences in deformation signature. Impingement of mantle "plumes" at lithospheric levels have been regarded as a direct cause for the formation of large igneous provinces (LIPS) and volcanic margins, and hot-spots at lithospheric levels are often associated with the formation of microcontinents. In particular the formation of the Jan Mayen microcontinent in the NE Atlantic, and the Danakil Block in the Afar region, has been described as microcontinents, continental ribbons or continental fragments formed in association with the Iceland and the Afar plumes, respectively. Two more such fragments can be added on the list. In the South Atlantic, the Sao Paulo Plateau rifted off the Santos Margin near the centre of the Tristan da Cuhna Plume, whereas, in the Arctic Basin, the Chukchi Plateau apparently wedged off NE Siberia prior to the formation of the Alpha-Mendelev Ridge, presumed to be a hot spot track. Although there are many differences between these regions when it comes to details in the tectonoic history, there are similarities in the tectono-magmatic evolution. 1) all four fragments appear to rotate off their mother plates near the time when the plume stem of the respective mantle plumes is projected to have emerged from underneath the adjacent continental lithosphere. 2) all four are characterized by a rift zone that appear to propagate away from the plume centre, and as such forms a deviation from the larger scale ocean opening. 3) and in three of the four regions seismic or field data document series of en-enchelon overlapping rift zones and magmatic centres. Using a proprietary modelling and visualization tool known as the 4DPlates, we have contrasted these regions by maps and cross sections, and their tectonic histories. 4DPlates allows a unique perspective and an improved method for communicating models of understanding.