FROM OROGENS TO OCEANS: THE IMPORTANCE OF INHERITANCE AND ITS CONTROL ON CONTINENTAL RIFTING AND FORMATION OF OCEANS

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One of the major achievements of the plate tectonic theory is the description of repeated opening and closing of ocean basins, also referred to as the Wilson Cycle. Although the Wilson Cycle, proposed by J. Tuzo Wilson in 1965, represents the most basic concept of plate tectonics, it is yet unclear what controls the localization and formation of plate boundaries, and what is their spatial and temporal evolution during continental breakup and seafloor spreading. In particular the importance of inheritance within the continental crust and underlying mantle, which can be thermal, structural or compositional, is yet little understood. This is mainly due to the fact that for a long time rift systems and orogens were studied independently one from each other, despite the fact that it was common knowledge that these processes follow and consequently overprint each other. In my presentation I will discuss using the example of the Tethys-Atlantic and Variscan-Alpine systems in Western Europe the link between orogenic and rifting processes. Indeed, the Carboniferous to present evolution of Western Europe represents one of the best-documented Wilson cycles. Mapping of the Mesozoic rift systems in Western Europe suggests that these rift systems were strongly controlled by Variscan inheritance. However, it is yet unclear how the inherited structures controlled in detail the complex spatial and lateral evolution of these rift systems and their rift architecture. Understanding this complex interaction between inherited and active rift processes is a pre requisite to understand the complex paleogeographic evolution of the Alpine system in Western Europe. Based on the example of the Alpine Tethys and Atlantic rift systems, I will discuss the importance of lithospheric inheritance resulting from the Variscan orogeny and how it may have influenced the evolution of the following rift systems. I will show thathy per-extended rift systems: 1) formed as v-shaped basins floored either by exhumed crust and/or subcontinental mantle or by thick magmatic sequences, 2) localized at the edges of stronger lithospheric domains, and 3) were guided by inherited structures explaining the strong segmentationof the Tethyan and N-Atlantic rift systems. In a final part of my presentation, I will address the question of how the rift structures of the Alpine Tethys may have controlled the subsequent evolution and structure of the Alpine orogen.The aim of my presentation is to show, that if we want to understand the localization and formation of plate boundaries within ocean continent transitions, we need to investigate the relation between ophiolites and marginal sequences, formed by remnants of thinned hydrated continental,mantle or magmatic rocks and the associated deep-water sedimentary successions.