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# Mesozoic tectonostratigraphy of the Western Tethys Realm – a review

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The Mesozoic sedimentary sequences in the Western Tethys Realm are incorporated in different mountain ranges, most of them located in the eastern Mediterranean area (Eastern and Southern Alps; Western, Eastern and Southern Carpathians; Dinarides, Albanides, Hellenides; units in the Pannonian realm: Pelso, Tisza), others are located to the west (e.g. the Apennine and the Betic Cordillera) These mountain ranges were formed since the Jurassic and experienced in parts polyphase mountain building processes and deformation, lasting until today. Therefore, the tectonostratigraphic evolution of the different Wilson cycles are in cases hard to assign to a specific cycle, because the evolution of the different Wilson cycles is overlapping. This resulted in contrasting palaeogeographic reconstructions and controversial regional tectonic interpretations.

In general, two different Wilson cycles can be distinguished. The older Wilson cycle reflect the geodynamic history of the Neo-Tethys (Meliata-Hallstatt, Maliac, Vardar, Pindos/Mirdita/Dinaridic oceans in other nomenclature), and the formed orogen is part of the Tethysides with following evolution as documented in the sedimentary record of the wider Adria plate:

– A Late Permian to Middle Anisian rift (graben) stadium with sedimentation of siliciclastics and carbonate ramp deposits in an epicontinental sea.
– A Middle Anisian to Middle Jurassic passive margin evolution after the late Middle Anisian oceanic break-up: a) The complex Middle to Late Triassic shallow- to deep-water carbonate platform evolution from the inner shelf (platform facies) to the outer shelf (open-marine basinal facies), and b) the Early to Middle Jurassic pelagic platform evolution.
– A Middle to Late Jurassic convergent tectonic regime triggered by ophiolite obduction (“active continental margin evolution”) with the interplay of thrusting, trench and trench-like basin formation, mass movements, and the onset and growth of carbonate platforms, followed by latest Jurassic to Early Cretaceous mountain uplift and unroofing.
– Final closure of the remaining open part of the Neo-Tethys (= Vardar Ocean) in Late Cretaceous to Paleogene times.

The younger Wilson cycle reflect the geodynamic history of the Alpine Atlantic (Ligurian, Piemont, Pennine, Vah, Alpine Tethys oceans in other nomenclature), and the formed orogen is part of the Alpides with following evolution as documented in the sedimentary record of the wider Adria plate:

– An Early Jurassic (Hettangian to Toarcian) rift (graben) stadium with sedimentation of fully marine deposits in areas the rift cross-cut the older proximal Neo-Tethys shelf and siliciclastics and carbonate ramp deposits in areas the rift cross-cut continental domains.
– A Middle Jurassic to Late Cretaceous passive margin evolution after the oceanic break-up since the Toarcian with formation of shallow-water platforms in latest Jurassic–earliest Cretaceous times in certain areas, but predominantly with deposition of hemipelagic sedimentary sequences.
– A Late Cretaceous to Paleogene convergent tectonic regime triggered by subduction and subsequent continent (wider Adria) – continent collision (Europe), followed by Neogene mountain uplift and unroofing.

In contrast to the fairly well understood Alpine Atlantic Wilson cycle a lot of open questions exist regarding the Neo-Tethys Wilson cycle. The main focus is therefore the time frame before the “Mid-Cretaceous” mountain building process with the rearrangement of tectonic units, i.e. the Mesozoic plate configuration in the Western Tethys Realm. Due to the fact that the “Mid-Cretaceous” and younger polyphase tectonic motions and block rotations draws a veil over the older Mesozoic plate configuration, several crucial and still topical questions remain, e.g.: 1) How many Triassic-Jurassic oceans existed in the Western Tethyan Realm. Show these oceanic domains different life cycles, i.e. is the opening and the closure of these oceanic domains contemporaneous or differ their age, and where are the suture zones? In general, two main types of contrasting interpretations/models remain: a) Multi-ocean reconstructions with several oceanic domains between continental blocks, and b) One-ocean reconstruction: an allochthonous model which interprets the ophiolites as overthrust ophiolitic nappe stack (or single ophiolite sheet) from the Neo-Tethys to the southeast to east.

2) Were the Southern Alps/Dinarides/Albanides/Hellenides, the Eastern Alps/Western Carpathians plus some Pannonian units (ALCAPA), some units in the Circum-Pannonian realm (e.g., Tisza Unit), and Pelagonia (including Drina-Ivanjica Unit) independent microplates between independent oceanic domains in Triassic-Jurassic times? Or have these units been scattered by polyphase younger tectonic movements modifying an united continental realm (north-western part of Pangaea) of the Triassic European shelf? The Early Jurassic Pangaea break-up resulted, e.g., in the opening of the Central Atlantic Ocean and its eastward continuation, the Alpine Atlantic.