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1D and 3D modelling of paleothermal indicators as a tool for reconstructing the kinematic evolution of the Sicilian fold-and-thrust belt (Italy)

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Organic petrography, X-ray diffraction on clay minerals and Rock-Eval pyrolysis were performed on samples collected from the Apennine-Maghrebian chain in Western Sicily (Imerese pelagic basin and the underlying Trapanese carbonate platform units) in the Kumeta and Busambra Mts. area. Paleothermal and geochemical data were used to constrain 1D and 3D burial-thermal reconstructions in order to: 1) define maximum temperatures and sedimentary vs. tectonic burial that the investigated Triassic-Miocene units underwent; 2) provide new insights into the kinematic evolution of the fold-and-thrust belt. Paleo-thermal data (vitrinite reflectance, Tmax from pyrolysis, illite content in mixed layers illite-smectite) and thermal modelling indicate levels of thermal maturity higher in the Imerese unit (regional hangingwall) than the Trapanese unit (regional footwall). Limited burial amounts (1.2 -1.3 km) occurred on top of the outcropping Trapanese unit. Additionally, the 3D model developed in the area indicates that the structural low developed between the Kumeta and Busambra structural highs hosted up to 1.9 km of sedimentary rocks indicating a complex distributions of the tectonic loads affecting the Trapanese unit. A new kinematic evolution scenario has been proposed, constrained by thermal data, taking into account such variability and Mesozoic pre-orogenic structures.