

**Tectonics of the Mont Tendre and Mont Risoux**  
**Mapping and forward modelling**  
**An investigation of the local geology and tectonics of the**  
**Jura folds and associated thrusts on a regional scale**

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The study area of this Master thesis is located in the Internal Jura Mountains (Haute Chaîne). It extends from the Mont Tendre, the Vallée de Joux and the Mont Risoux in the Canton of Vaud (Switzerland) to the Vallée de la Saine in the Jura department (France).

The Jura Mountains are a crescent shaped fold-and-thrust belt which is formed due to the exhumation of the External Crystalline Massifs which triggered the detachment of the Mesozoic sedimentary cover from its crystalline substratum along the basal main décollement level. Hence, the allochthonous sedimentary cover was displaced, thrust and folded by thin-skinned deformation mechanism above the mechanical basement towards the Northern Alpine Front (Buxtorf, 1907; Boyer & Elliot, 1982). Thus, the deformation style of the Jura FTB is characterised as thrust-related folding.

Fieldwork, new geological and tectonic maps, the description of the Risoux-1 deep well by Winnock (1961), the interpretation of seismic lines by Sommaruga (1997) and the geological thickness models by Schori (2021) served as the foundation for the construction of a geological cross-section and of a forward modelled kinematically balanced cross-section.

The geological cross-section and the forward model allow to propose the following results concerning the deep structures and the thrust development of the Mont Tendre und Mont Risoux area: the Vallée de la Saine thrust is the main regional thrust of the study area which roots in the basal main décollement level within the Keuper units (Gruber, 2017) and causes the duplication of almost the entire Mesozoic unit. The main flat of the Vallée de la Saine thrust is 15 km long and is situated at the base of the Cretaceous units. Secondary thrusts showing a fishtail and a pop-up structure rooting in the Vallée de la Saine thrust are identified in the Risoux-1 deep well (Winnock, 1961) and explain the multiple duplications of the Mesozoic cover beneath the Mont Risoux anticline. The forward model and the newly established relative chronology of the thrust development show that the Mont Tendre anticline s.l. is composed of an alternating sequence of minor anticlines and synclines which are formed first by the foreland oriented Vallée de Joux thrust and then by a backthrusting wedge and hinterland oriented backthrusts. In this regard, this work proposes that the study area is composed of one big tectonic “nappe”, the Mont Risoux nappe, that got displaced along the Vallée de la Saine thrust. The southern part of the Mont Risoux nappe is considered as the Mont Tendre sub-unit which is delimited by the Vallée de Joux thrust that dissects the Mont Risoux nappe.

This work represents a first modelling approach of the Mont Tendre anticline s.l. The level of detail of the model works on a regional scale but has to be refined to match the complex local surface and subsurface data. In order to validate the deep structures of the non-balanced cross-section, the forward model has to be extended to the Mont Risoux.

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