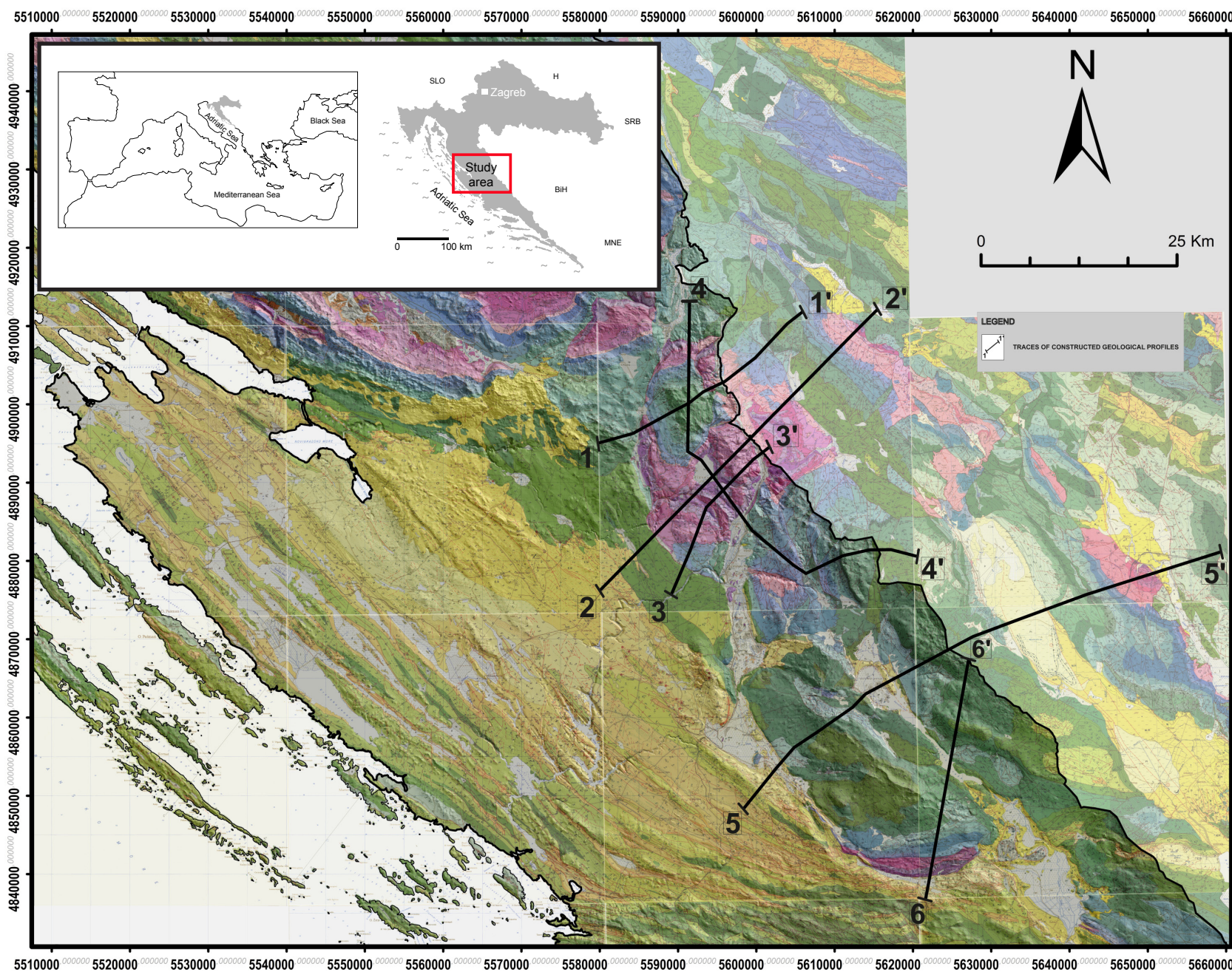


Double-vergent Thrusting in the External Dinarides of Croatia: Consequences on Deposition, Tectonics and Hydrocarbon System Evolution

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The External Dinarides form a thin-skinned fold-thrust belt extending in NW–SE direction along the northeastern Adriatic coast. They comprise the regional-scale tectonic units derived from the Adriatic microplate, being composed of more than 7 km-thick succession of predominantly carbonate and subordinate clastic and igneous rocks of Carboniferous to Miocene age.

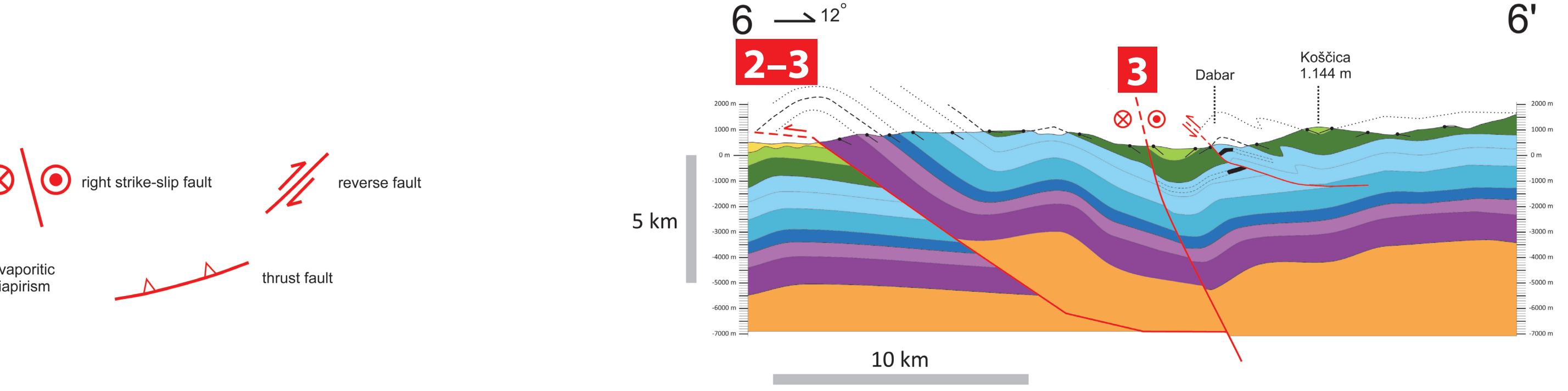
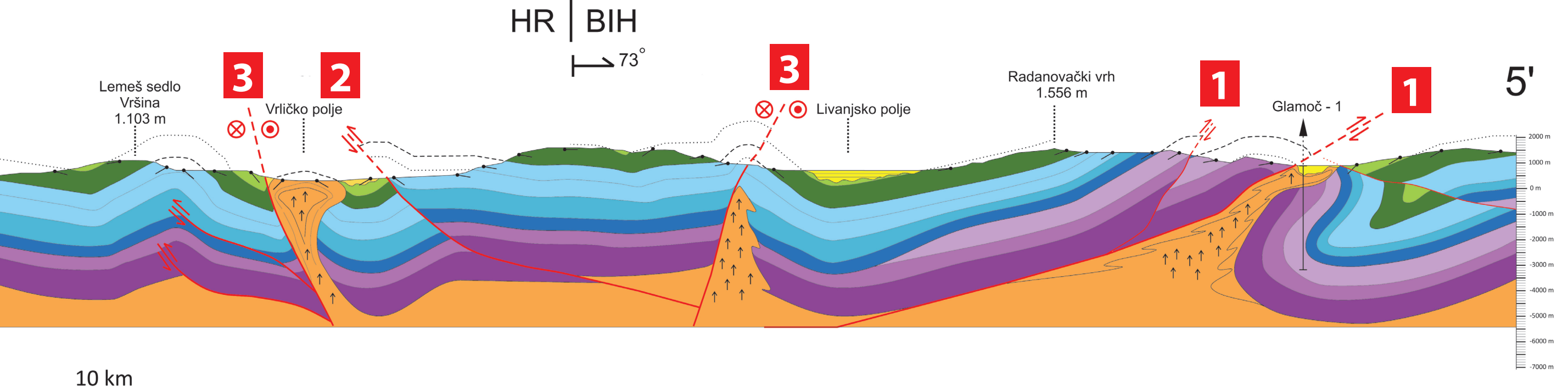
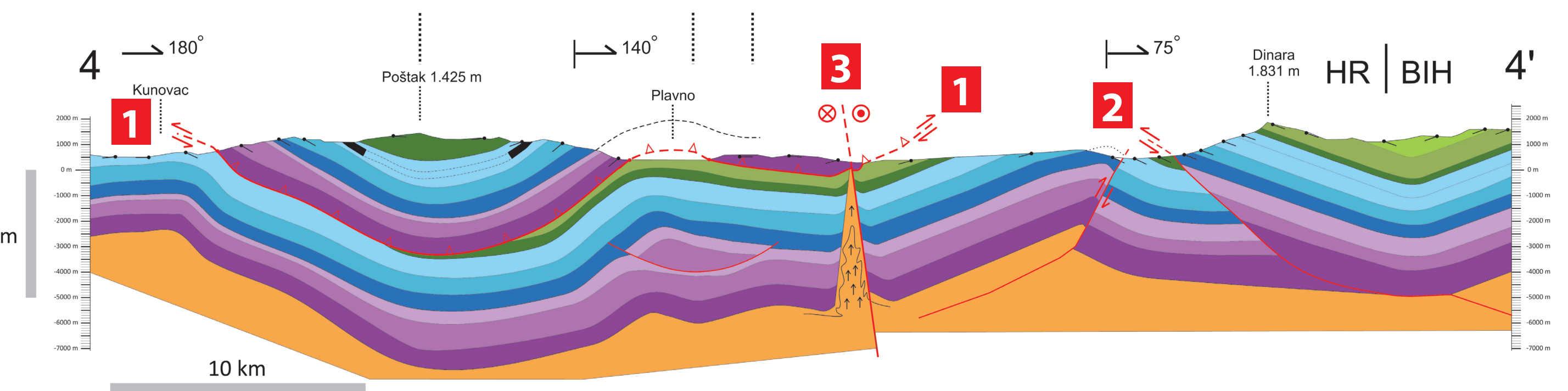
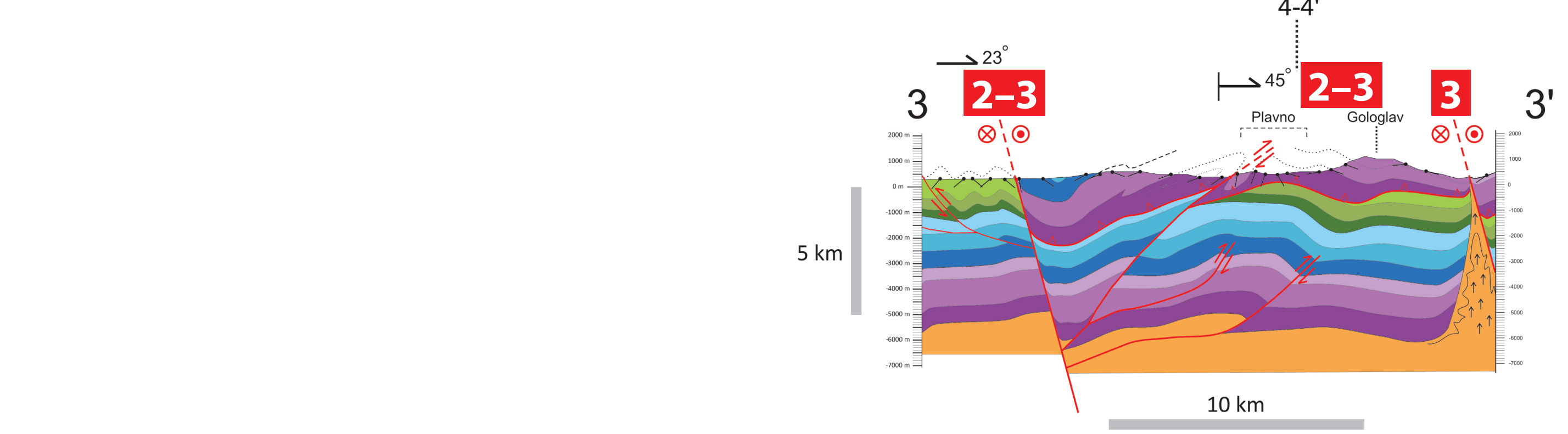
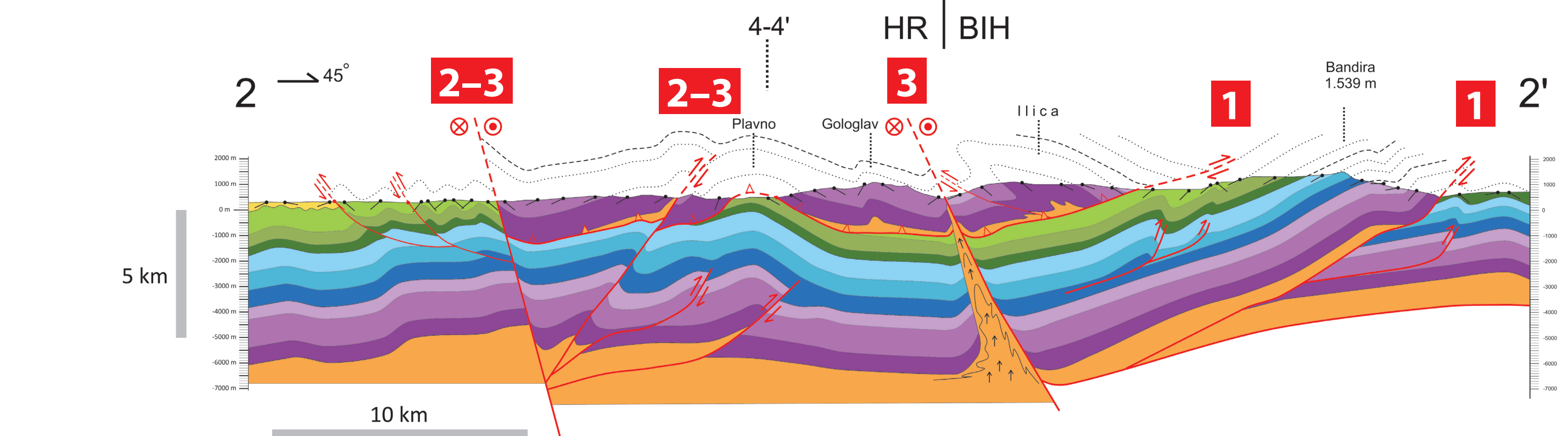
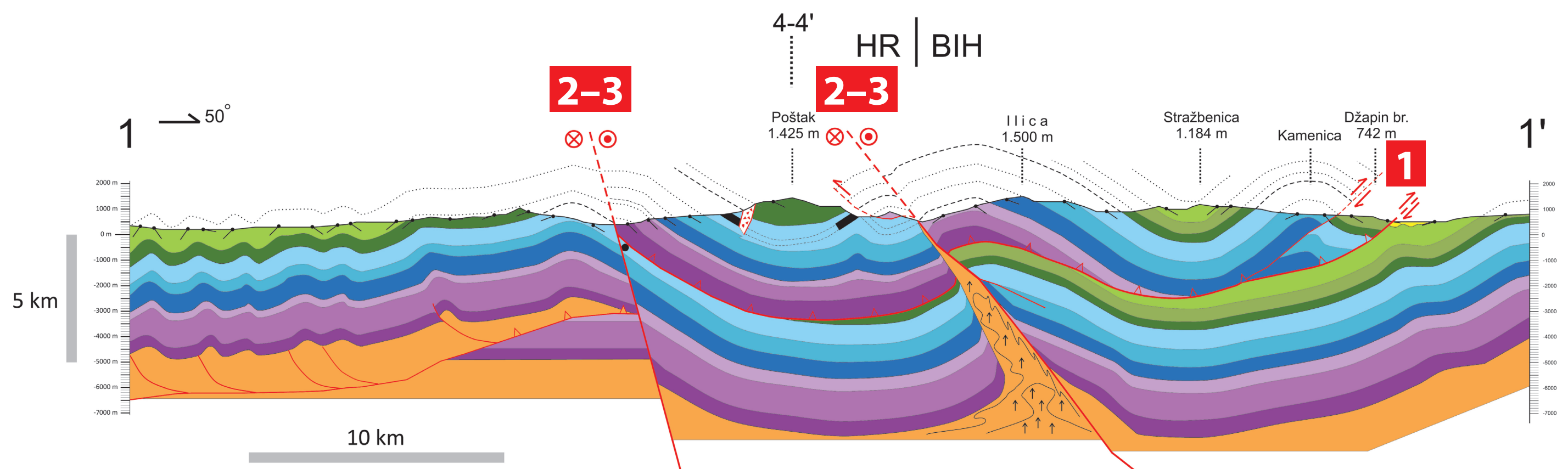
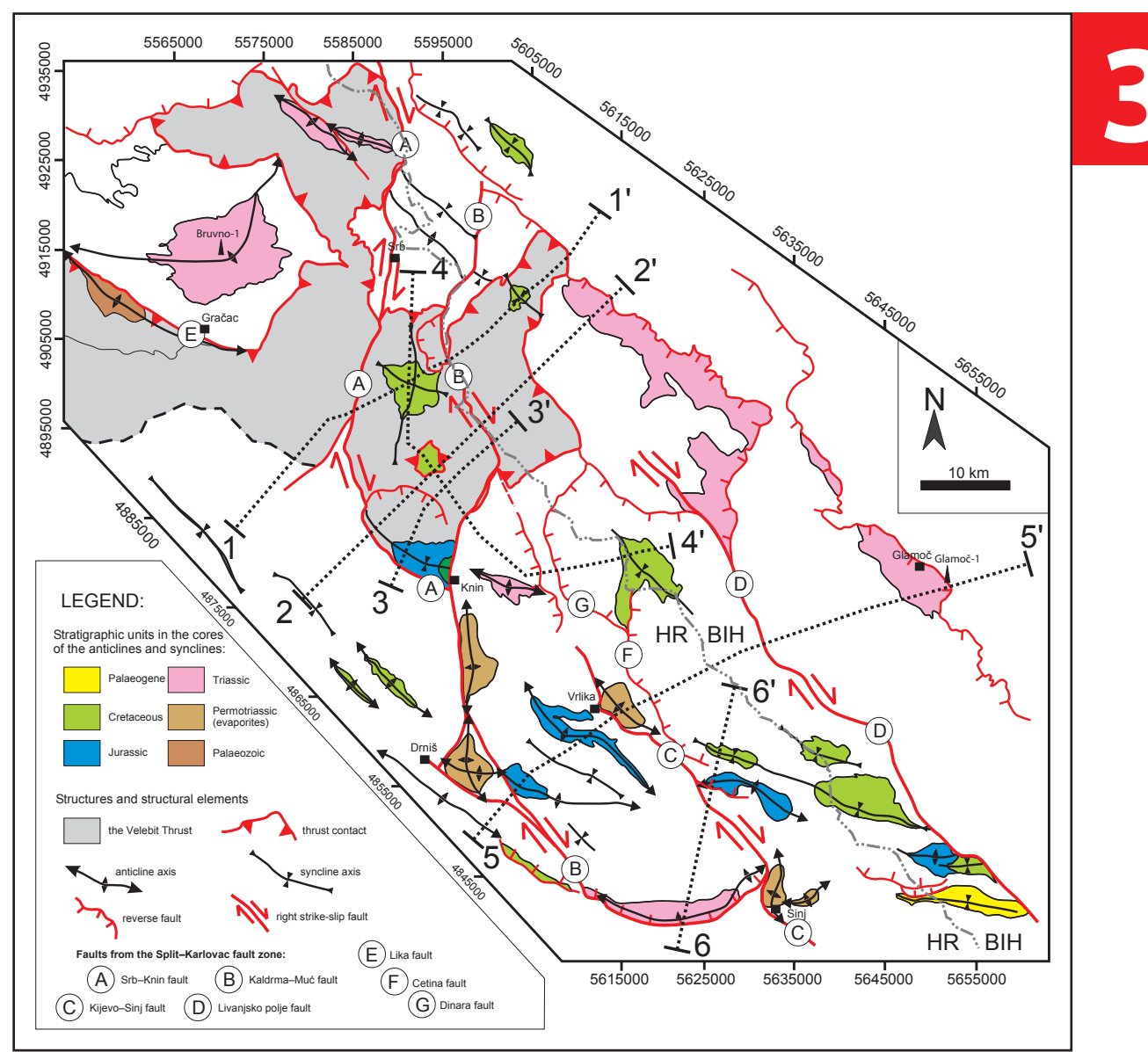
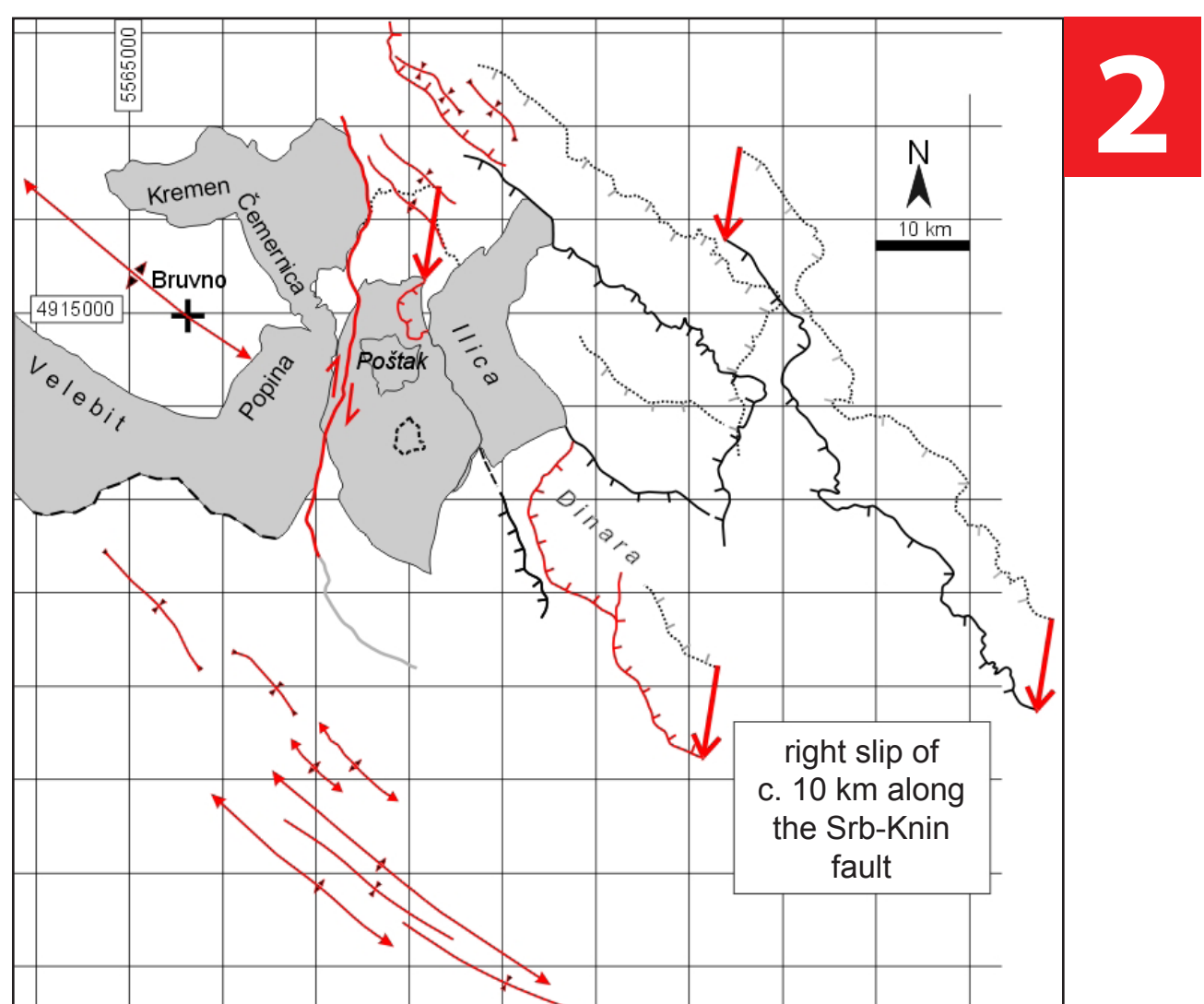
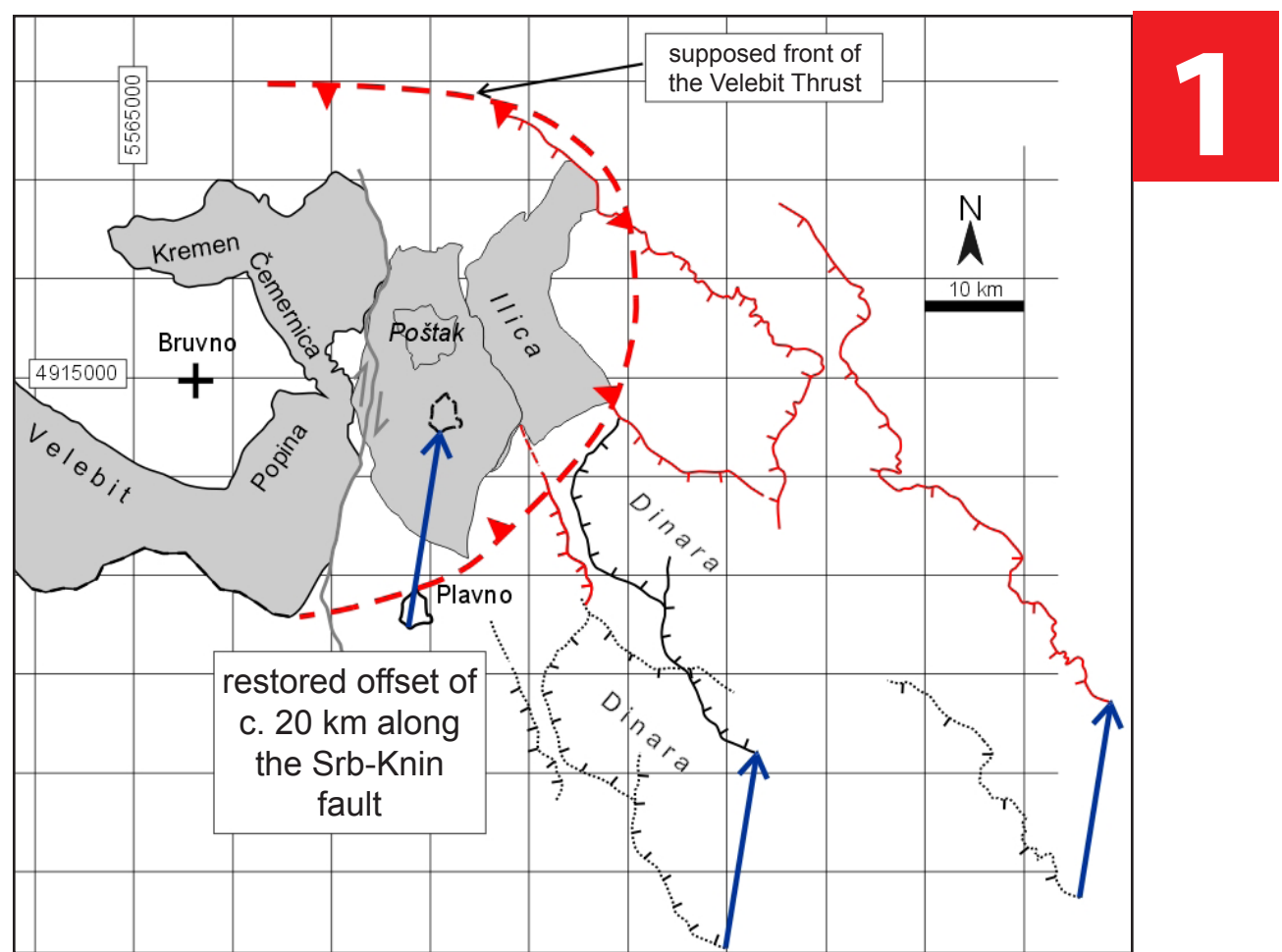
The majority of the carbonates accumulated from the Late Triassic to Late Cretaceous, when the Adriatic Carbonate Platform became gradually affected by generally NE–SW directed compression due to the collision between the Adriatic and European plates.

During the Eocene–Oligocene the deposition was restricted into several NW–SE trending basins of both the foredeep and the piggy-back type, controlled by the propagating thrust sheets. They were characterized by mostly carbonate deposition on ramps and deep-marine deposition in distal parts.

As a result of continuous geological explorations for more than a century, the present-day structural architecture of the External Dinarides is presumed as being almost exclusively the result of two tectonic phases: the phase of Late Eocene–Oligocene SW-verging and SW-propagating thrusting, overprinted by the younger, presumably Miocene, phase of dextral wrenching.

However, according to our recent multidisciplinary investigation focused on Kimmeridgian source-rocks of the central part of the External Dinarides in Croatia, the first order NW–SE striking thrust structures characterised by the opposite vergence, i.e. the NE tectonic transport direction are clearly distinguished. As the NE-vergent thrusting was the oldest and prevailing tectonic phase in formation of this part of the Dinarides. Hence, it is of the major importance for reconstruction of tectonic and hydrocarbon system evolution and the origin of massive and voluminous carbonate breccia associated with the NE-vergent structures.

TECTONIC EVENT	PRESUMED AGE	KINEMATICS	DEPOSITION	HYDROCARBON SYSTEM
1	Middle–Late Eocene	Predominantly top-NE thrusting and formation of the Velebit thrust-sheet of a passive-roof duplex geometry	Onset of the Velebit Breccia formation and penecontemporaneous beginning of marine gravity flow deposition ('flysch') in a complex foreland and piggyback depositional system of the External Dinarides	Middle Triassic and Upper Jurassic source rocks only partly involved in top-NE thrusting could be still preserved in the original structural position either in a footwall or in areas not affected by the thrusting event; M.-U. Eocene clastic deposits could represent a good seal (especially where predominantly composed of marls)
2	Late Eocene–Oligocene	Top-SW imbrication and fault-propagation folding associated with onset of dextral slip along the Split–Karlovac line	Continuation of marine gravity flow deposition (flysch) in a more distal SW-part of the complex foreland and formation of piggyback depositional system gradually infilled by coarse-grain alluvial plain and alluvial fan deposits in the proximal parts (Promina Beds)	Formation of major km-scale anticlines in the frontal SW part of the External Dinarides locally still preserving Middle Triassic and Upper Jurassic source rocks in their cores and Upper Eocene–Oligocene clastics on their crests (as potential seal)
3	Oligocene–Miocene(?)	The final stage of the dextral slip along the Split–Karlovac line and rising of salt diapirs	Final stages of infilling of the former foreland and piggyback basins and formation of Dinaric Lake System	Late stage in salt migration could contribute in both formation of local traps and seals



LEGEND

