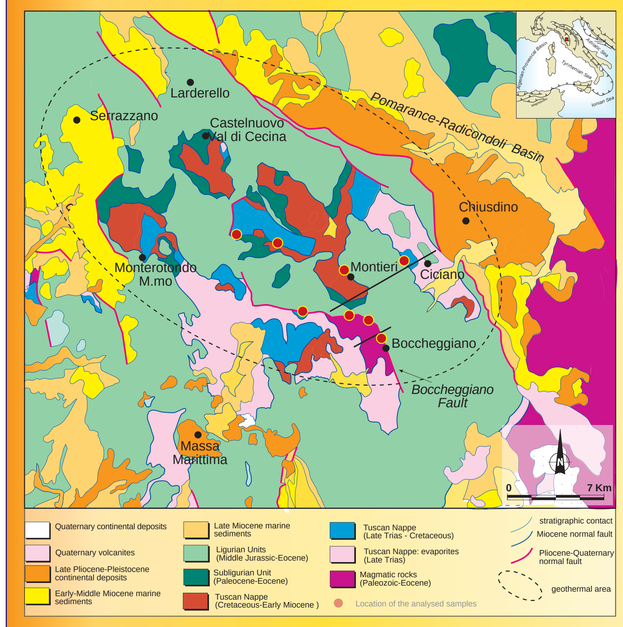
Fluid-flow in the Boccheggiano-Montieri palaeogeothermal system: insights for the Larderello-Travale field

Domenico Liotta[1], Andrea Brogi[2], Paolo Fulignati[3], Giovanni Ruggieri[4] & Andrea Dini[5]

(1) Dipartimento di Geologia e Geofisica, Università di Bari, Via Orabona 4, 70125 Bari. (2) Dipartimento di Scienze della Terra, Università di Siena, Via Laterina 8, 53100 Siena. (3) Dipartimento di Scienze della Terra, Università di Pisa, Via Santa Maria 53, 56100 Pisa. (4) CNR- Istituto di Geoscienze e Georisorse, Via G. La Pira, 4, 50121 Firenze. (5) CNR- Istituto di Geoscienze e Georisorse, Via G. Moruzzi, 1 - 56124 Pisa (Italy), PISA .

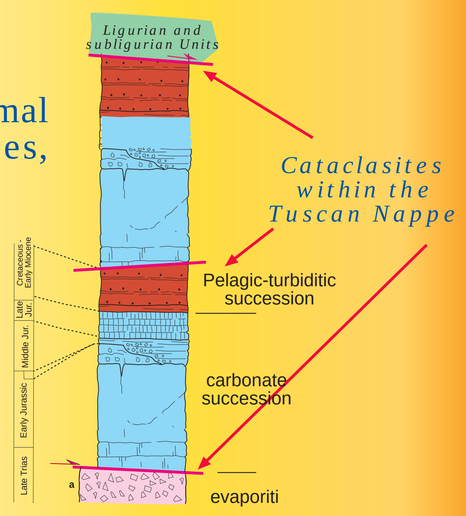


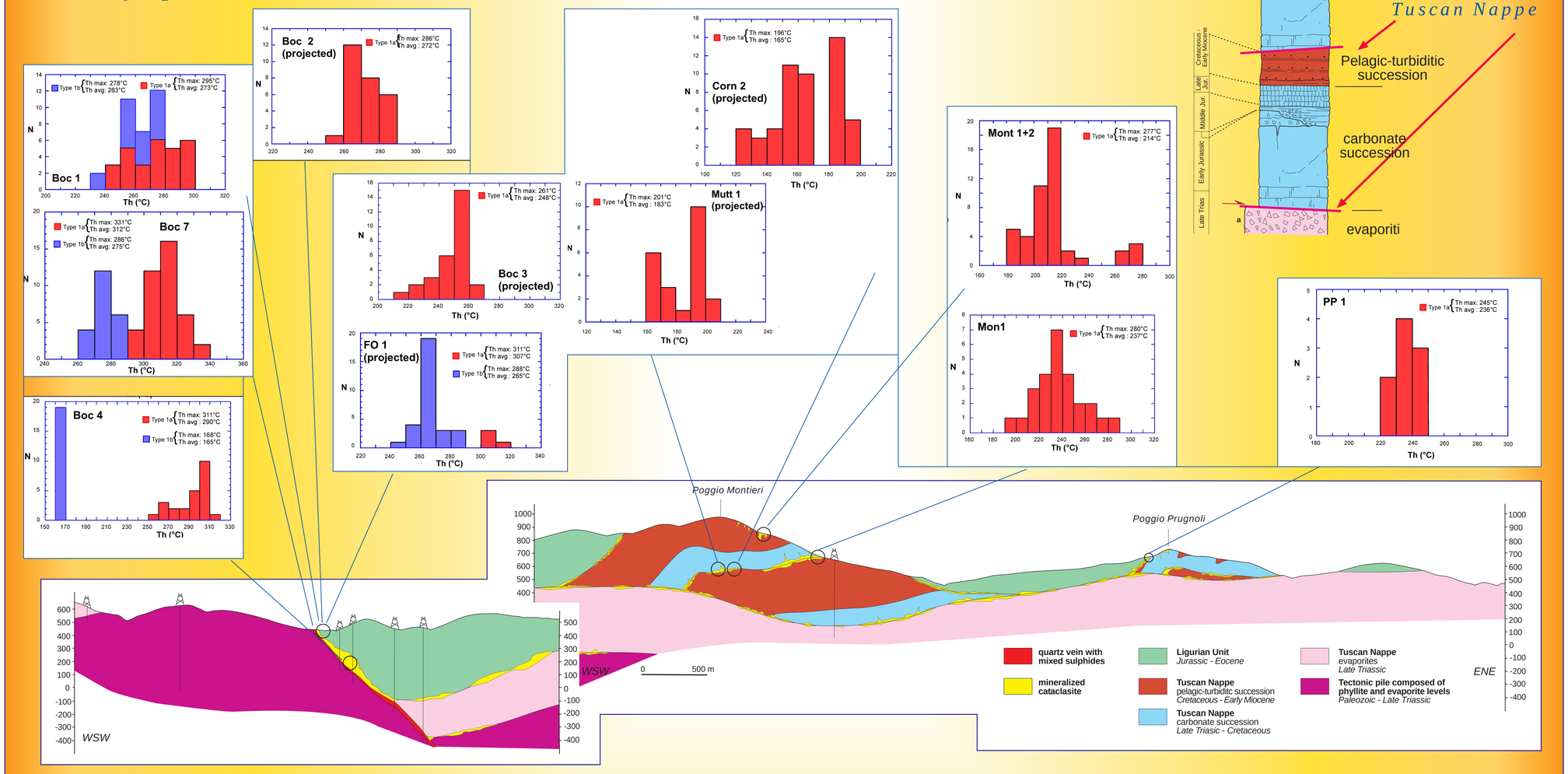
PROBLEM: the migration of geothermal fluids in the upper crust of the southern Tuscany represents a continuous task for successful exploration of geothermal resources. The fluid-flow pathway in the Larderello-Travale geothermal field is few understood and object of a timely debate

METHODOLOGY: to study the past for understanding the Present. Fluid inclusions of hydrothermal minerals and geometry of the mineralised geological bodies.

STUDY AREA: Montieri-Boccheggiano area where a close relation among Plio-Pleistocene magmatism, genesis of hydrothermal fluid and main Pliocene-Pleistocene normal faults (particularly the Boccheggiano Fault) have been highlighted. Hydrothermal mineralisation characterised by mixed sulphides have been also exploited in sub-horizontal cataclasites developed during the Late Oligocene-Late Miocene, away from the Pliocene-Pleistocene normal faults.

AIM OF THIS STUDY is to verify the possible relationships between the hydrothermal circulation within the Pliocene-Pleistocene normal fault and that within the oldest cataclasites, far away up to 10 km.





MAIN RESULTS are:

a) The Oligocene-Miocene cataclasites were dissected by the Boccheggiano Fault. The Boccheggiano Fault also dissected the magmatic body emplaced at depth in the Montieri area.

b) Fluid inclusions indicate that the hydrothermal fluids circulated in the Montieri-Boccheggiano system were composed of meteoric water which interacted with the Late Triassic evaporites.

c) Fluid inclusions indicate that the hydrothermal fluids were progressively coldest moving away from the Boccheggiano Fault.

d) The sub-horizontal cataclasites related to the stacking of the Tuscan Nappe (Late Oligocene-Early Miocene) and extensional tectonics (Middle-Late Miocene) represented the reservoirs for the hydrothermal fluids.

The hydrothermal fluid-flow model provides a common fluid circulating both in the damage zone of the Boccheggiano Fault and in the oldest cataclasites dissected by the fault. The Boccheggiano Fault could represents the main conduit for both meteoric waters infiltration and hydrothermal fluids upwelling, which dispersed in the oldest cataclasites dissected by the faults.