

CAMPOTRERA OPHIOLITE (REGGIO EMILIA, NORTHERN ITALY): AN IMPORTANT NATURAL PRESERVE FOR GEOLOGY AND MINERALOGY

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The Natural Preserve of Campotrera, in the Enza river valley (Reggio Emilia province, Northern Apennine), was established in 1999 and its management was entrusted to Canossa municipality, where the preserve is present. This Natural Preserve includes a huge ophiolite outcrop, composed by pillow-lavas basalts and subordinately by polygenic and ophiolitic breccias. Since 2000, the SRSN has been cooperating with Canossa municipality in order to reconstruct the quarrying history of these ophiolitic bodies and to investigate their mineralogy. For this purpose, the SRSN established a collaboration with the University of Parma (Department of Physics and Department of Earth Sciences) and with the Department of Applied Geological Sciences and Geophysics of Leoben (Austria).



General view of the area



An hydrothermal vein of datolite



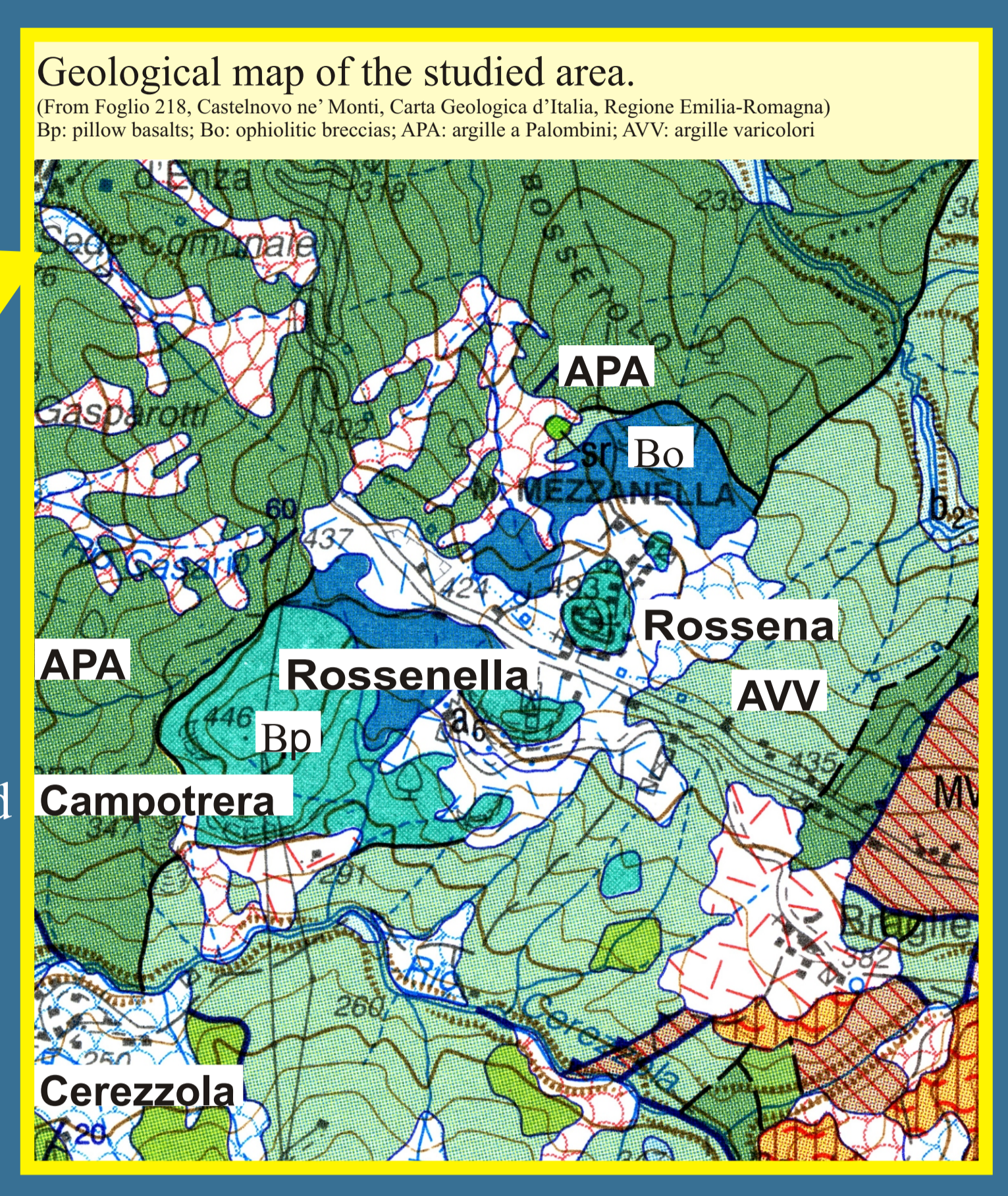
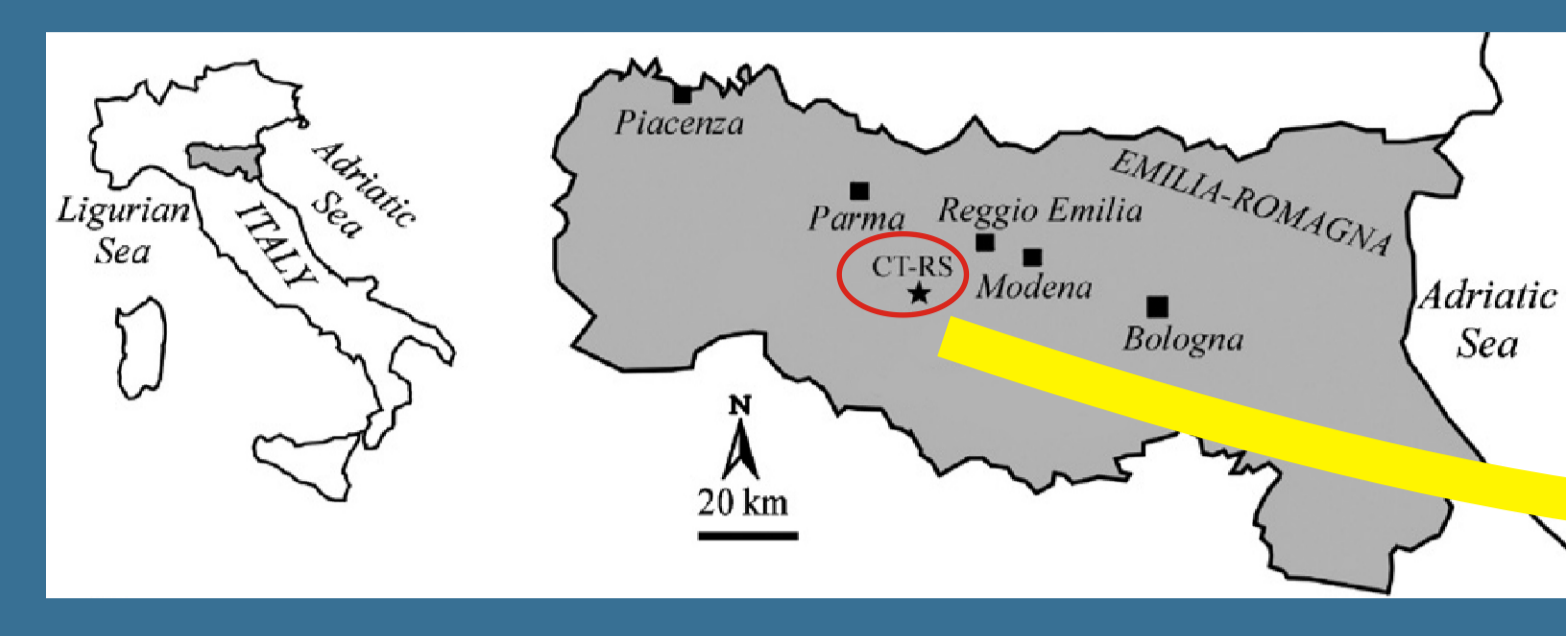
An overview of the West quarry in Campotrera



A pillow-lava section



A typical exposition of pillow-lava basalts at Rossenella quarry



Geological map of the studied area. (From Foglio 218, Castelvetro ne' Monti, Carta Geologica d'Italia, Regione Emilia-Romagna) Bo: pillow basalts; Bo: ophiolitic breccias; APA: argille a Palombini; AVV: argille varicolori

Campotrera ophiolitic block, together with nearby Rossena and Rossenella ones, represents an ophiolite (Campotrera ophiolite) belonging to the External Ligurian Units, composed by ophiolitic slide-blocks embedded in a sedimentary melange that marks the base of flysch-like sequences of Cretaceous-Eocene age. These basalts underwent a low-grade metamorphism (oceanic metamorphism), represented by prehnite-pumpellyite to greenschist-facies assemblages. The main chemical effect of this transformation is silica liberation and calcium mobilization. In ophiolitic basalts plagioclase is transformed into albite+prehnite±epidote±pumpellyite association, clinopyroxene is partially replaced by chlorite+amphibole (actinolite) and Fe-Ti oxide phases are frequently converted into titanite.

Many hydrothermal veins, up to 30 centimetres in thickness, are hosted in basalt-pillows and breccias, and here several minerals occur: datolite, calcite, prehnite and to a lesser extent natrolite, analcime, barite, hematite, magnetite. Sometimes these minerals can occur as well-faceted crystals. Indeed, Campotrera is one of the most famous places in Italy for the beauty and the size of its minerals, especially centimetric red datolite crystals.



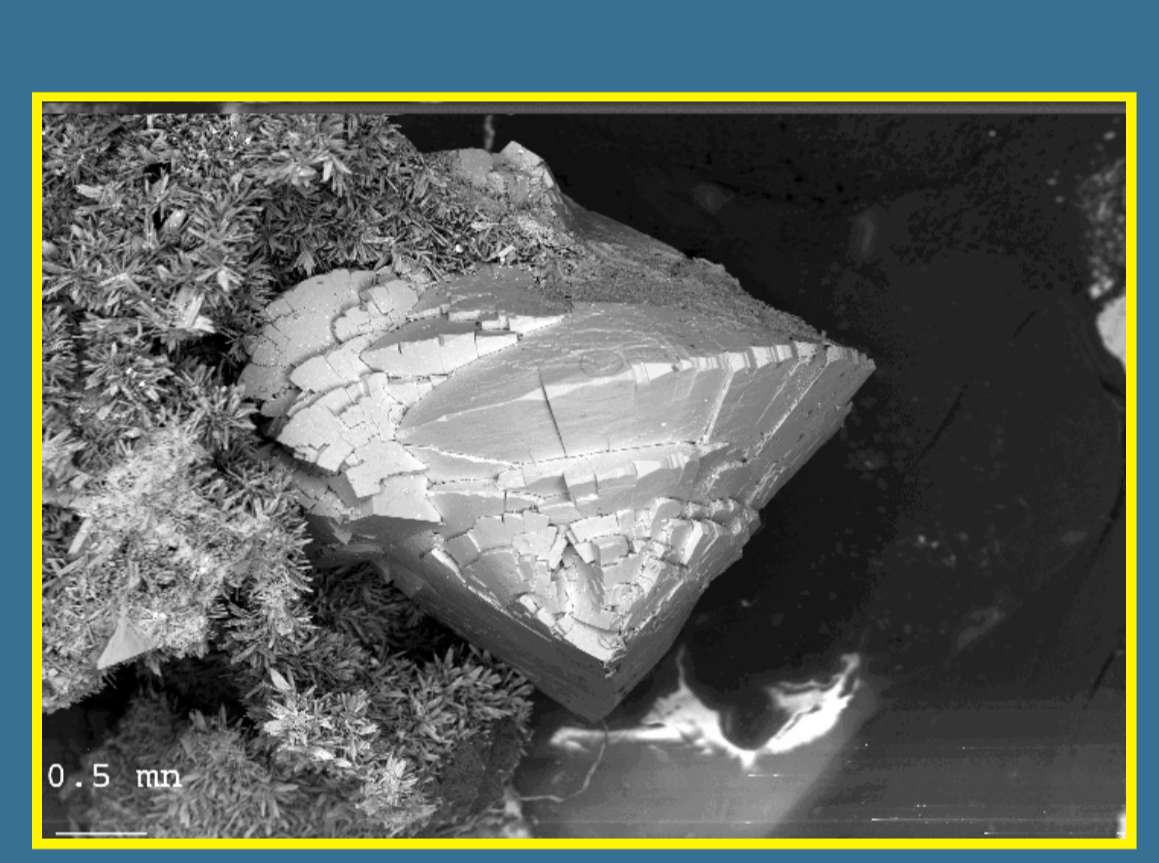
An historical view of the quarrying work



Barite (3 mm height)



Analcime (length single crystal 0.5 mm)



Prehnite over Pumpellyite



Natrolite (6 mm height)



Prehnite (7.5 mm length)



Datolite (4.3 mm length)



Datolite with hematitic inclusions (4 mm length)



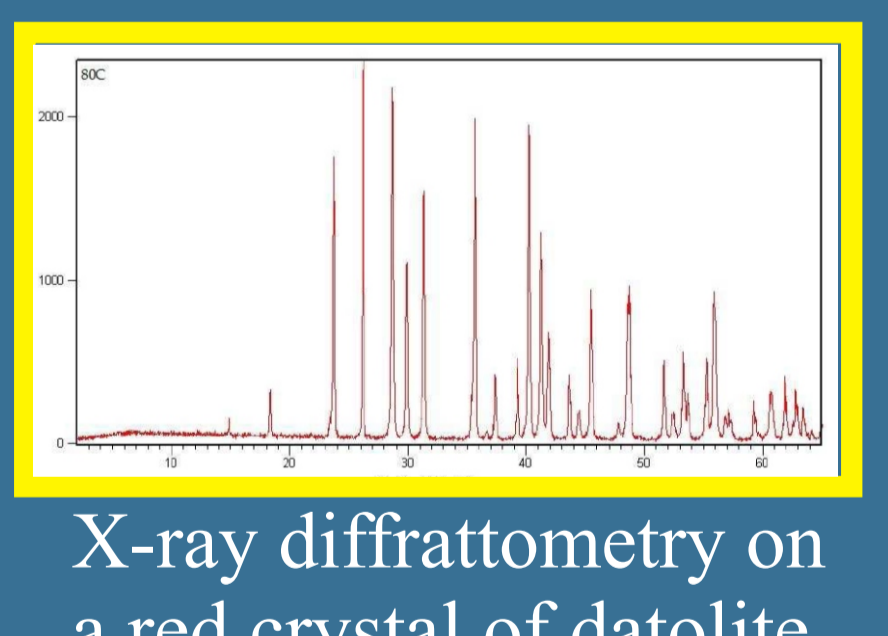
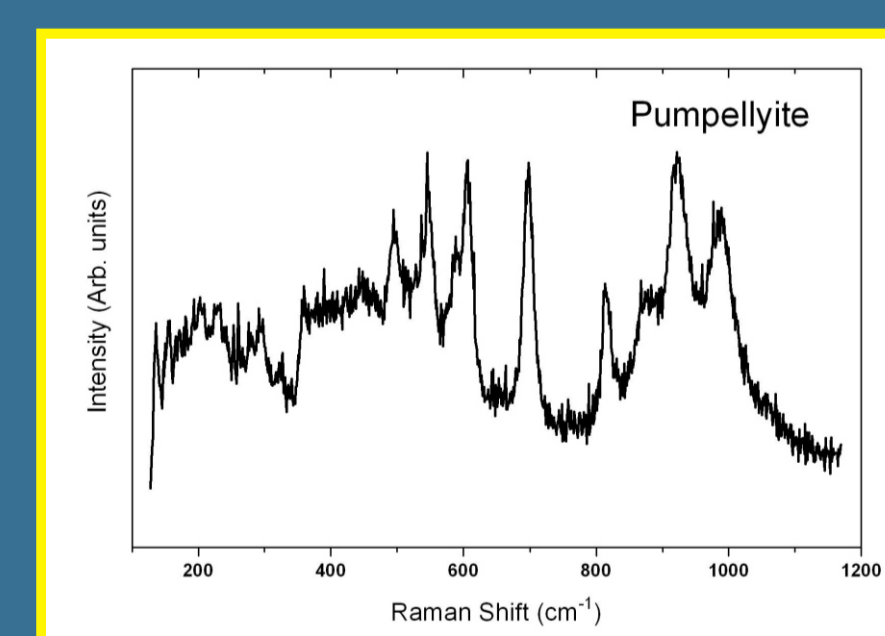
Hematitic inclusions in calcite (7.2 mm length)



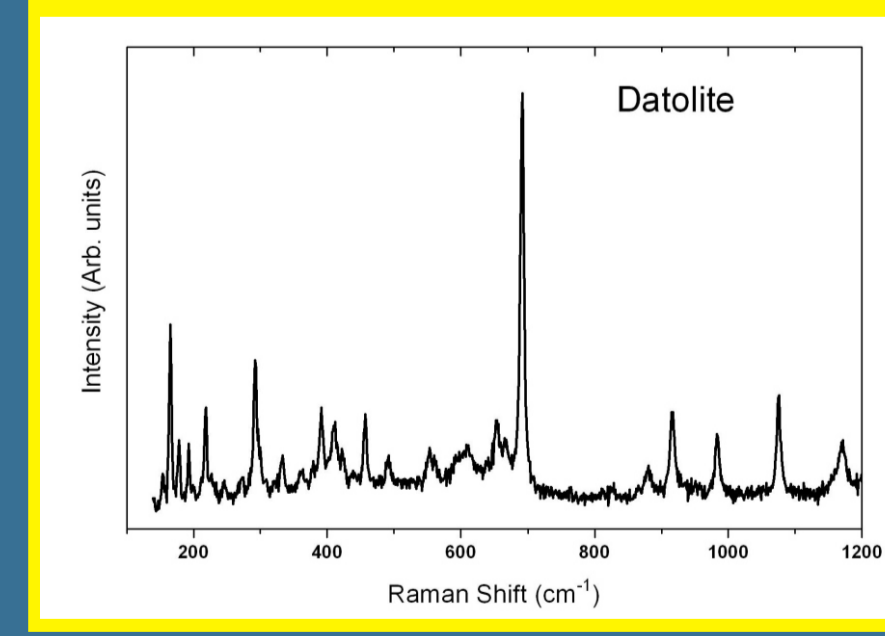
Calcite (5.3 mm length)



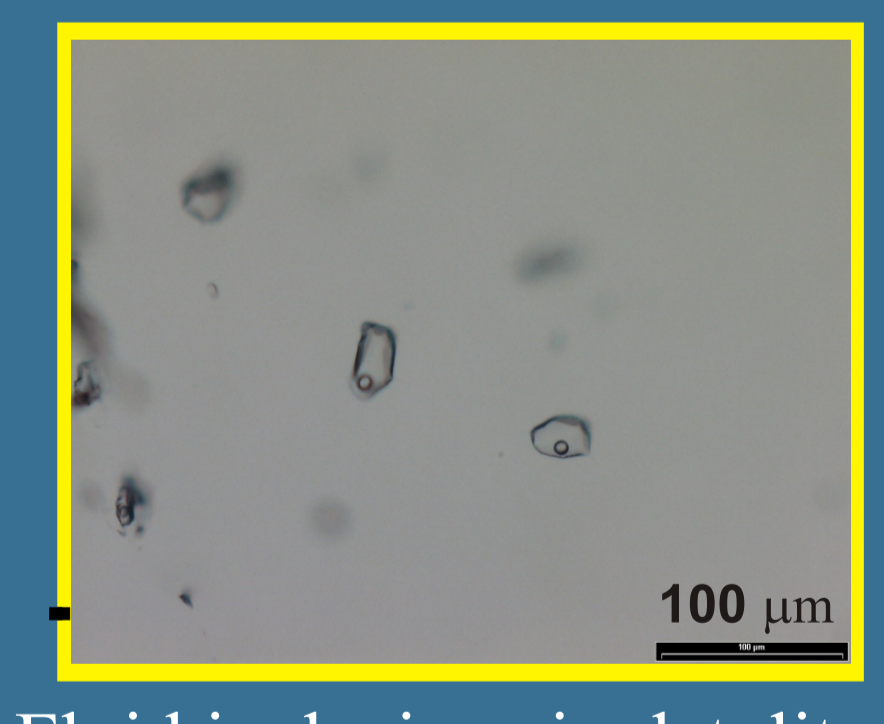
Pumpellyite



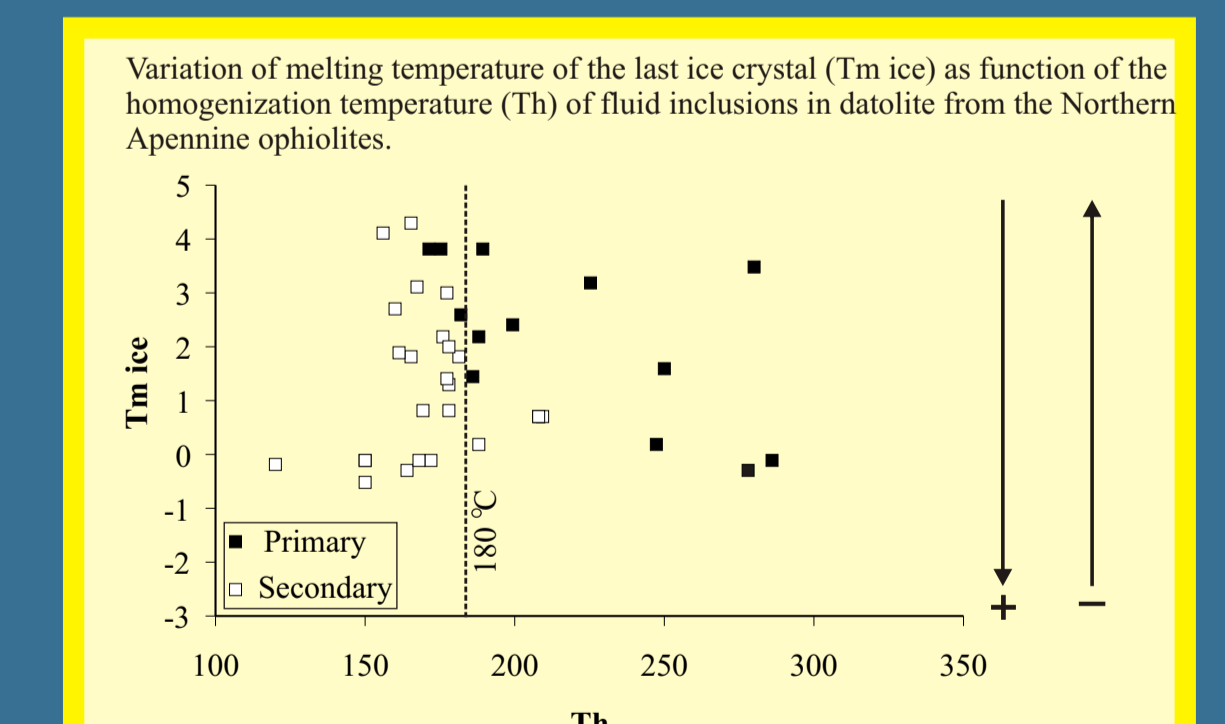
X-ray diffractometry on a red crystal of datolite (from Bordini V., 2012)



Micro-Raman spectra of some Campotrera minerals



Fluid inclusions in datolite



(Modified from Zaccarini et al., 2008)

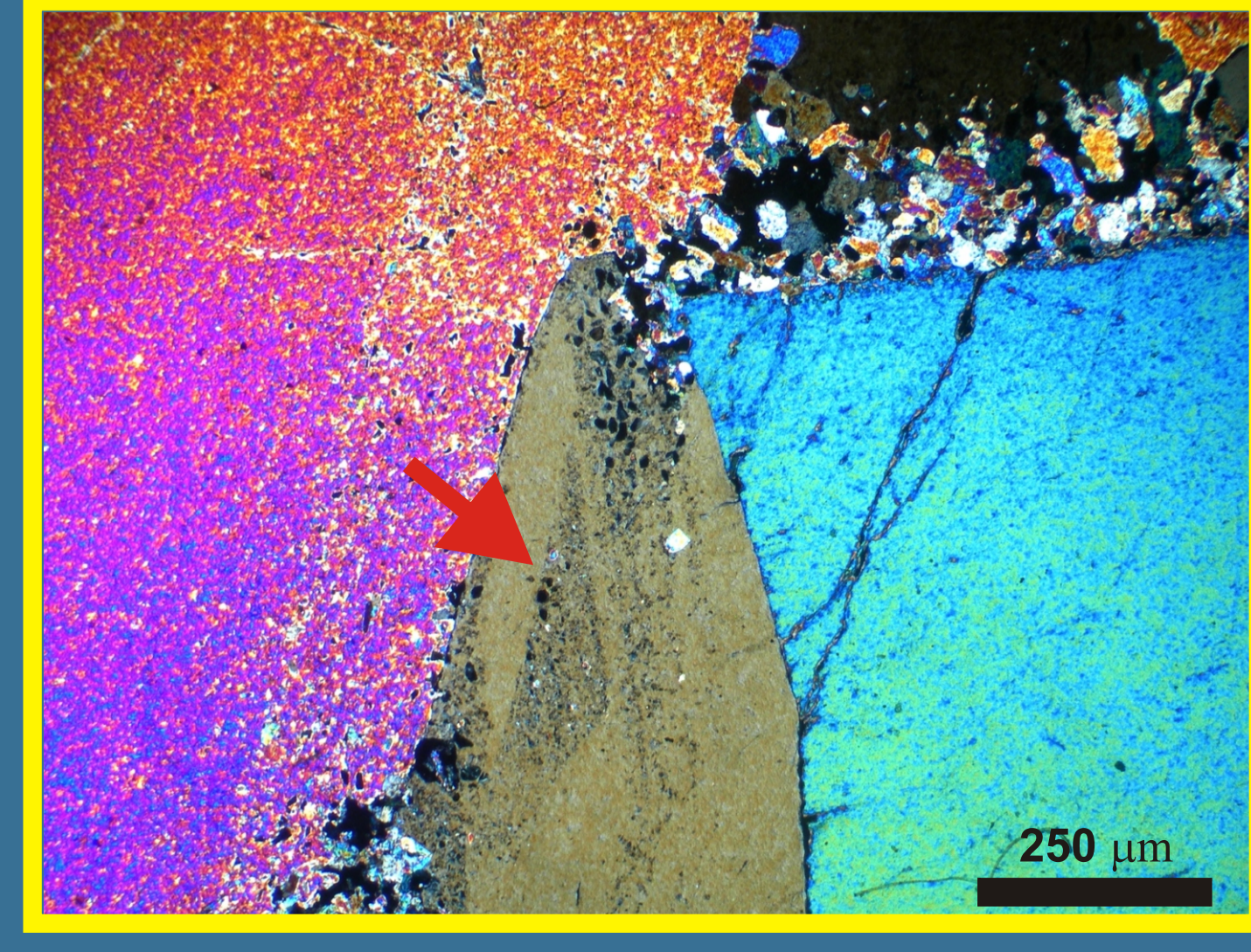
Selected electron microprobe analyses of datolite from Campotrera

	B ₂ O ₃ (wt%)	2SiO ₂ (wt%)	2CaO (wt%)	B (wt%)	Si	Ca	H ₂ O (wt%)	Si/B
Theoretical	21.76	37.56	35.05	6.76	17.56	25.05	5.63	2.60
Campotrera	17.86	36.58	28.18	6.51	17.10	20.14	5.64	2.62
	15.49	34.61	27.86	6.19	16.18	19.91		2.61
	17.65	37.53	27.27	6.47	17.54	19.49		2.71
	16.12	36.55	26.31	5.91	16.99	18.80		2.87

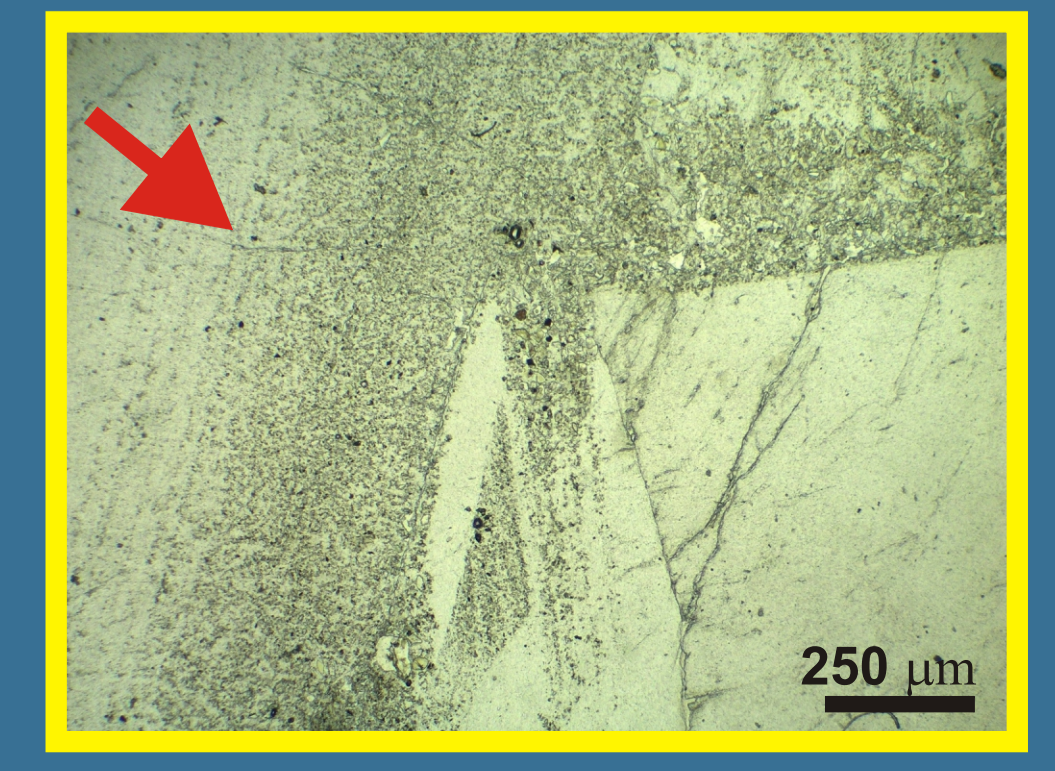
ICP-MS analyses of trace elements (ppm) in datolite from Campotrera ophiolites.

Sample	CT	CT	CT	RS
Li	0.84	0.54	0.18	0.03
Rb	0.10	0.13	0.13	0.08
Cs	4.76	1.35	5.57	5.09
Sr	17.25	39.21	6.41	6.74
Ba	3.20	1.42	1.59	2.50
Sc	0.00	0.49	0.38	0.28
V	2.38	2.37	0.85	1.25
Cr	1.36	1.38	0.85	1.31
Co	0.31	0.24	0.22	0.22
Ni	4.14	2.46	1.96	8.52
Cu	0.90	1.57	1.42	2.50
Zn	0.00	21.11	0.00	1.26
Ga	0.91	0.71	0.71	0.83
Y	0.76	1.19	0.08	0.49
Nb	0.03	0.02	0.02	0.01
Ta	0.00	0.00	0.00	0.00
Zr	0.17	0.49	0.00	0.02
Hf	0.01	0.02	0.00	0.01
Mo	0.08	0.11	0.10	0.08
Sa	0.99	1.22	0.25	0.28
Ti	0.01	0.02	0.02	0.02
Pb	0.70	6.01	0.88	0.42
U	0.00	0.00	0.00	0.01
Tb	0.01	0.01	0.01	0.01
La	5.20	0.62	6.26	6.32
Ce	0.39	0.59	0.46	1.09
Pr	0.06	0.08	0.03	0.11
Nd	0.27	0.34	0.08	0.30
Sm	0.08	0.10	0.02	0.05
Eu	0.02	0.03	0.00	0.01
Gd	0.11	0.12	0.02	0.06
Tb	0.02	0.03	0.01	0.01
Dy	0.08	0.11	0.00	0.01
Ho	0.03	0.04	0.02	0.02
Er	0.06	0.06	0.00	0.01
Tm	0.01	0.02	0.01	0.01
Yb	0.04	0.04	0.01	0.01
Lu	0.01	0.01	0.00	0.01
REE	6.38	2.19	6.92	8.02

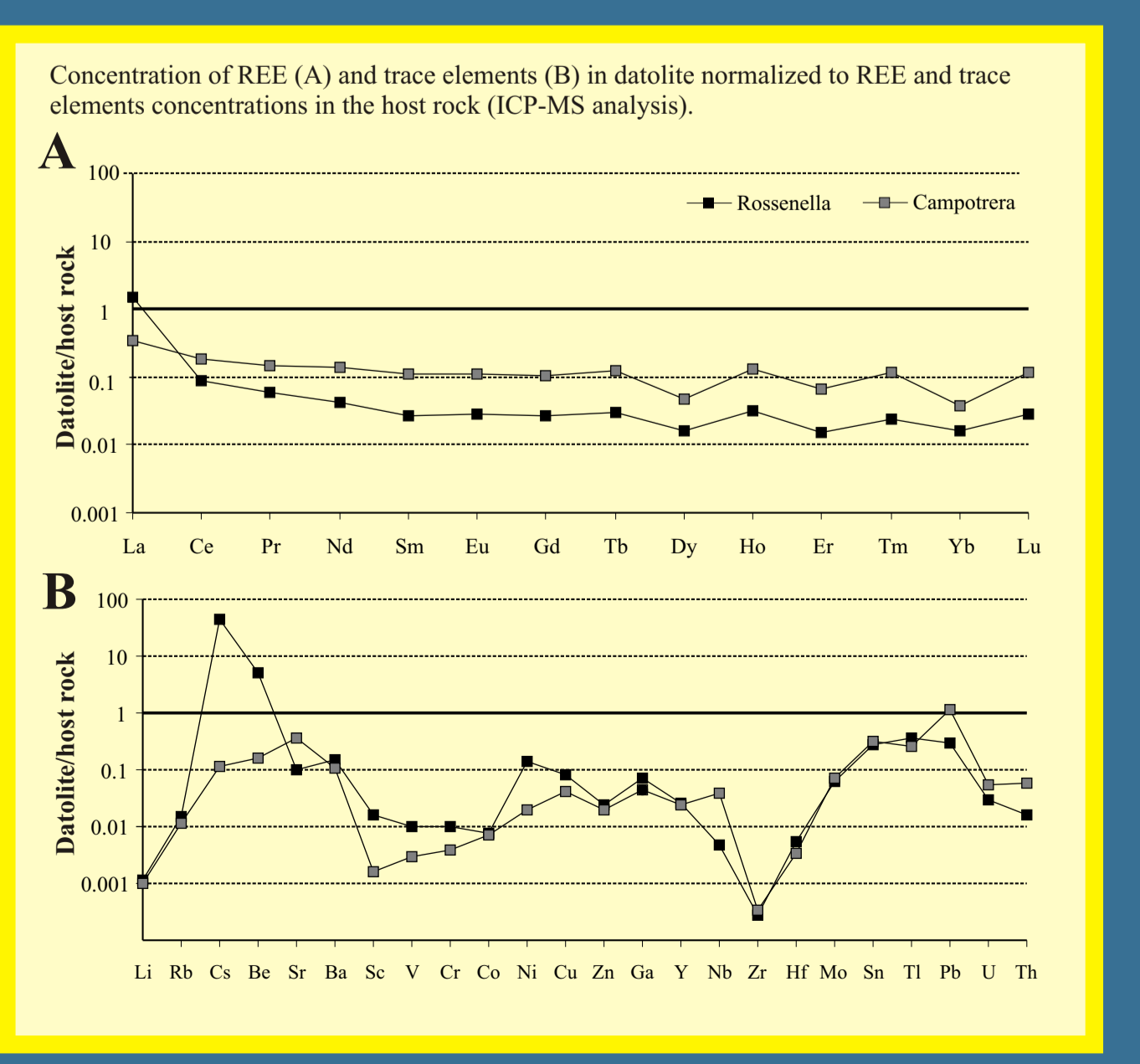
CT = Campotrera; RS = Rossenella. All samples from veins within basalts



Microphotographs of datolite crystals. Small inclusions of calcite and hematite (red arrows) are parallel to the crystal faces



Several gemmological analysis were carried out by the Earth Science Department in Pavia on a red crystal of datolite: a 0.51 ct gem of reddish one, 5 mm length was carried out, with refractive index 1.632, 1.654, 1.670 (from Bordini V., 2012)



(Modified from Zaccarini et al., 2008)

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