

Cap de Creus, Cadaqués, north-eastern Spain



Almost perfect exposure make Cap de Creus a classical excursion and mapping training area that is visited by many universities every year. It harbours some of the "type localities" of well-known structures, such as shear bands, "flanking folds", and apparent boudinage in dykes. Situated in the Parc Natural de Cap de Creus on the beautiful Catalanian Costa Brava, it is well suited for a 3-7 days excursion almost any time of the year.

Geology

Main objectives	Teaching of the analysis of complex structures in medium to high-grade metamorphic clastic sediments.
Type of activities	Outcrop excursions, small scale mapping, field exercises
Local geology	Eastern end of the Pyrenean Axial Zone, with Palaeozoic metamorphic meta-sediments, deformed during the Variscan Orogeny. Multiple folding and shear zones. Abundant pegmatite intrusions.
Highlights	Spectacular retrograde mylonite zones with textbook examples of shear bands, porphyroclasts, foliation deflecting into shearzones; Complex folding and refolding patterns; overprint of folds by shear zones; Boudinage and apparent boudinage. All in excellent exposure!
Landscape, vegetation	Rocky coastal hills and low cliffs, with sparse Mediterranean vegetation
Outcrop type and conditions	Almost perfect exposure, especially near the shore. Sparse vegetation. Mostly pavements, some low cliff faces
Area of interest	About 5 x 10 km. Elevation 0 to 300 m.
Accessibility	Easy. Single bitumen road through the area. Access to all outcrops directly along the road or on foot from the road, 5 minutes to 2 hours walking.
Weather	Excursion can be held all year round. Spring and Autumn most suitable. Winter is chilly and windy. Disadvantage of Summer is that it is warm to hot, and the area is crowded with tourists.
Access restrictions	Natural Park. Permission (free) is needed for group access and fieldwork. No samples to be taken. Apply for permission (2 months ahead) from Parc Natural de Cap de Creus, a.o. Ms Victòria Riera, Palau de l'Abat, Monastir de St Pere de Rodes, 17489 el Port de la Selva, Spain. Fax: +34-972-193192
Itinerary links	1-2 day excursion along the coast from Roses (15 km) to Cala Joncols can be done from Cadaqués. Excursions to Cap de Creus can be combined with trips to the Pyrenees (Roc de Frausa, Canigo, Andorra) and the Catalanian Coastal Ranges with Variscan structures, as well as Tertiary volcanics and mafic dykes.

Logistics

Nearest towns/cities Cadaqués (3 km), Figueres (30 km), Girona (75 km), Barcelona (150 km)

Airports	Girona (75 km), Barcelona (150 km), Perpignan (100 km)
Hotels	Many hotels in tourist resort Cadaqués: from about 30 €/night
Bungalows & hostels	Club Carpe Diem (Cadaqués): 70-110 €/night for 6-7 person bungalow, Lighthouse lodging (Cap de Creus):€/night groups of 6 (depends on season)
Camping	Camping Cadaqués (Cadaqués): from 15 €/night (very basic)
Car rental	Cadaqués, Roses, Girona (airport), Barcelona, etc.
Restaurants	Lighthouse restaurant & bar (in the area- Cap de Creus) and many restaurants/bars in Cadaqués. Meals from about 12 €.
Medic/hospital	Medics & clinic in Cadaqués, main hospital in Girona (75 km)
Other activities and attractions	Bird watching and unique flora in the natural park. Cadaqués is a beach resort, offering beaches, swimming, diving, boat trips, etc. Salvador Dalí's house (Cadaqués) and museum (Figueres). Monastery of san Pere de Rodes, Fortresses of Figueres (30 km) and Roses (15 km). Costa Brava.

Information

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Field guides	Carreras, Druguet. Guide to the Cap de Creus shear zones
Topo-maps	Hipermapa de Catalunya http://www10.gencat.net/ptop/AppJava/cat/actuacions/territori/hipermapa.jsp
Geological maps	1:25:000 map of Catalonia , This map has insufficient detail in the small area of interest. Maps in geological publications are more useful.
References	Bons, Druguet, Hamann, Carreras, Passchier (2004) Apparent boudinage in dykes. J. Struct. Geol. 26, 625-636. Carreras (2001) Zooming on Northern cap de Creus shear zones. J. Struct. Geol. 23, 1457-1486 Druguet, Passchier, Carreras, Victor, den Brok (1996) Analysis of a complex high-strain zone at Cap de Creus, Spain. Tectonophysics 280, 31-45 Druguet (2001) Development of high thermal gradients by coeval transpression and magmatism during the Variscan orogeny: insights from the Cap de Creus (Eastern Pyrenees). Tectonophysics 332, 275-293. Carreras, J., Druguet, E., Griera, A., Soldevila, J. 2004. Strain and deformation history in a syntectonic pluton. The case of the Roses granodiorite (Cap de Creus, Eastern Pyrenees). In: G I Alsop, R E Holdsworth, K J W McCaffrey, M Hand (eds.), Flow Processes in Faults and Shear Zones, 307-319. Geological Society of London Special Publication. Carreras, J., Druguet, E., Griera, A. 2005. Shear zone-related folds. Journal of Structural Geology 27, 1229-1251

Other remarks none

Photos and maps:



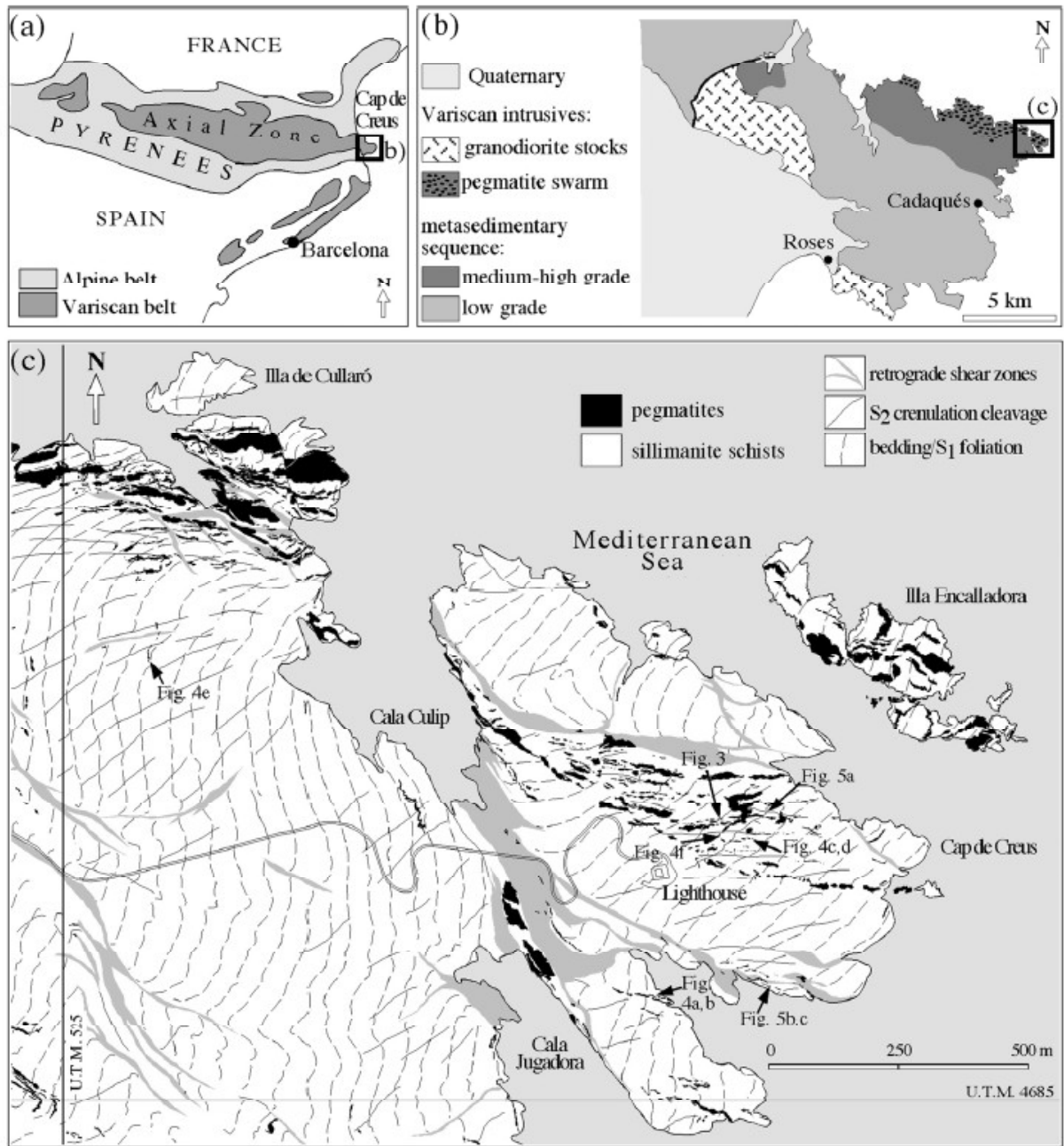
Buckle fold in a sandstone layer



folds in micaschist, being cut by a ductile shear zone



D1 folds in bedding, overprinted by aS2 foliation (vertical)



Geological map from Bons et al, 2004.