

# PORTUGAL FIELDTRIPS

A new partnership between IGI (UK) and Geo Logica (Portugal)



□ The Lisbon and Western Country regions of Portugal have a great potential for geological tours of scientific and technical interest

- Petroleum systems
- Tectonics (from rifting to inversion and salt tectonics)
- Underground energy and nuclear waste storage
- Geothermal

□ The region is easily accessible, of spectacular nature, and has numerous sites of geological and touristic interest

- Short travelling distances and proximity to Lisbon airport
- Numerous points of geological interest and good quality outcrops, including beaches, hills and valleys, caves, quarries and mines
- The region is punctuated by historical villages and monuments of interest, and is renowned for its surfing hot-spots
- Plenty of options for excellent quality food and accommodation

Petroleum systems	Rifting	Depositional systems & environments	Dinosaur-geology museum & park
CH <sub>4</sub> - CO <sub>2</sub> - H <sub>2</sub> electricity storage	Basin inversion	Source rocks, seals & reservoirs	Mines, quarries & caves
Nuclear waste storage	Magmatism	Faults, folds and unconformities	Hot springs & spas
Geothermal	Metamorphism	Lavas, sills, dykes & batholiths	Historical villages and sites
Hydrothermalism	Salt tectonics	Mechanical & thermal contacts	Landscapes and seascapes
	Weathering	Salt diapirs & caves	

## Example of a week programme

The tours offer great flexibility, and can be adapted to the themes, main sites of geological and/or touristic and sightseeing interest, type and location of the accommodations, as well as the duration of the tour and days of the week/weekend. In this example, the daily tours start at 10.00, allowing for a pre-tour description of the sites and geological context.

### Monday (starting at 14:00)

#### Lisbon Airport-Santa Cruz (1h)

- Kimmeridge-age shales
- Fractures with bitumen
- Fluvio-deltaic reservoirs
- Diapirs diverting rivers
- Hydrothermalism along salt walls

#### Or Lisbon-Lourinhã (1h 15m)

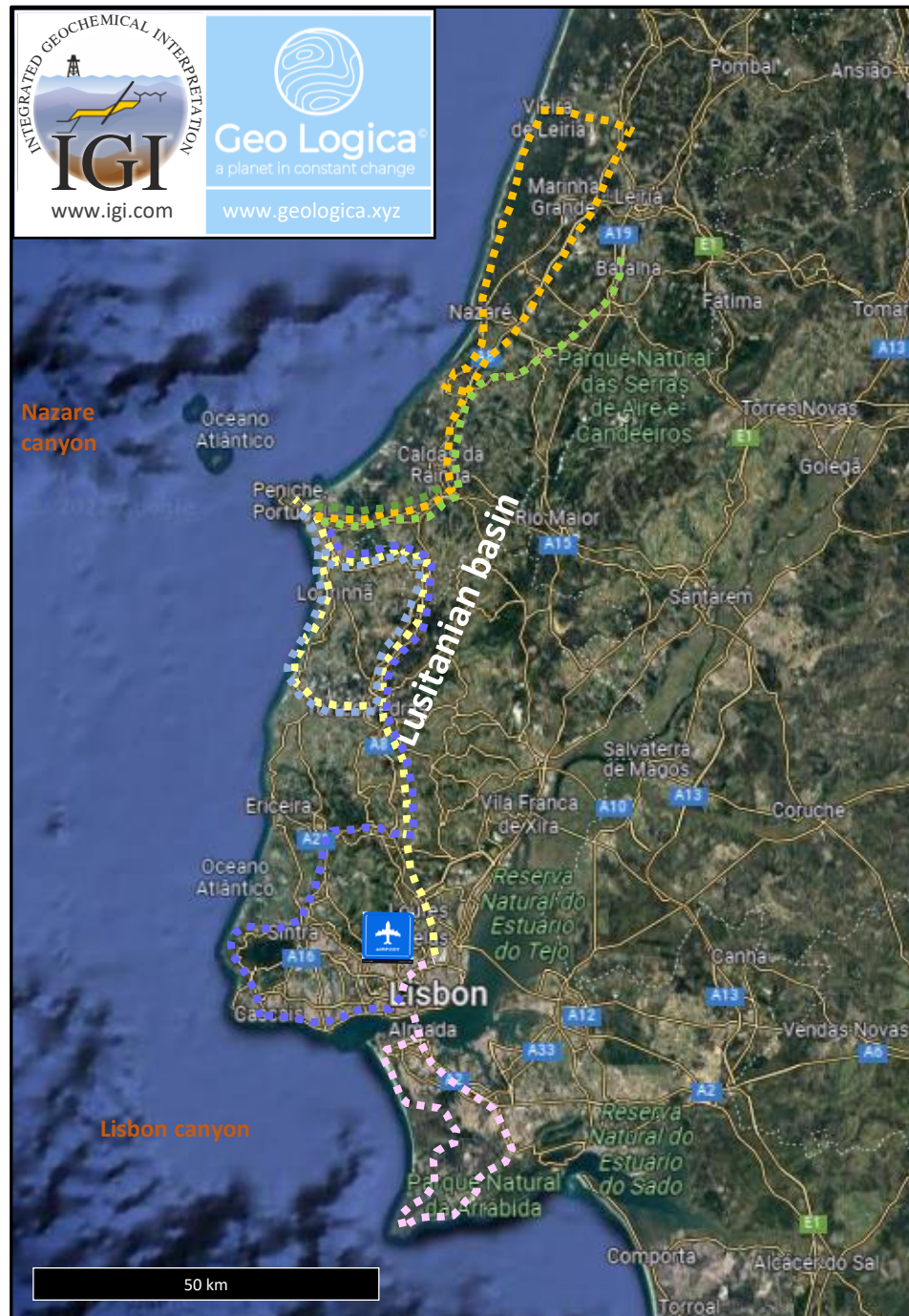
- Dinosaur and geological park/museum/walk
- #### Santa Cruz-Peniche hotel (1h)

### Tuesday (starting at 10:00)

#### Peniche-Pedrogão (1h 15m)

- Lower Jurassic source rock and bitumen
- Exhumed paleo-oilfield
- Slumps in diapir flank (soft limestones)
- Clay-limestone stratification and mechanical contacts
- Nazaré beach sightseeing and canyon

- Dinner in São Martino do Porto Bay
- #### São Martinho do Porto-Peniche (45m)



### Wednesday (starting at 10:00)

#### Peniche-Óbidos (30m)

- Dissolution breccias
- Intra-salt carbonate stringers (ME-proxy)
- Salt structures for CO<sub>2</sub> and H<sub>2</sub> storage
- Gypsum mine with folded stratification of gypsum-clays-marls

#### Or Peniche-Batalha (1h)

- Limestone caves
- Quarry with CO<sub>2</sub> capture for algae culture
- Gypsum mine with folded stratification
- Dinner in Obidos (fortified town)

#### Obidos-Peniche (30m)

### Thursday (starting at 10:00)

#### Peniche-Guincho (2h)

- Walk over time (Jurassic-Tertiary)
- Sintra massif intrusion, folding and fracturing (radial fracture patterns)
- Intrusions and contact metamorphism
- Dinner by the beach

#### Sintra-Lisbon/Cascais hotel (30m)

### Friday (starting at 10:00)

- Hydrothermalism in Lisbon
- #### Drive to the airport

#### Or Arrábida tour (Saturday departure)

- Inversion tectonics (mountain building, faults, folding and halokinesis)
- Miocene fossil cliffs and fossils
- Geology, landscape and wines

# Example of a 1-Day trip (Pedrogão-Nazaré-Peniche)

The day starts with 1h and 15 min travel by bus between Peniche (Hotel) and Pedrogão, followed by a light snack outside to enjoy the seascape and refill for the geological journey.

In Pedras Negras Beach we will observe an exhumed paleo-oil field (bitumen) trapped against the wall of São Pedro de Moel (SPM) diapir.

10 min by bus to Praia da Concha, where we will see the slumps and folded lower Jurassic limestones units adjacent to the flank of the salt diapir, exemplifying early deformation due to halokinesis (salt movement).

15 min by bus to Pedra do Ouro Beach, where we will be observing the most prolific source rock in the basin, which are marine shales from the Early Jurassic that generated the oil in the area, and examples of fracture patterns in interbedded marly and hard limestone units.

10 min bus to Senhora da Vitória Headland, to spot the topographic depression due to salt dissolution and caprock breccia at the top of São Pedro de Moel diapir.

10 min walk to Azeche tar mine, where we will observe a 50 m vertical column of tar-saturated sandstones, which have been mined since 1857, and several major J-Hook unconformities. Eocene marls acted as the top seal indicating active hydrocarbon migration in recent times.

10 min walk to Nazaré to understand the surface geological expression of the Nazaré fault, which is also associated with a spectacular submarine canyon, and is involved in the origin of the Nazaré giant waves (up to 30 m... surfable).

20 min by bus to São Martinho do Porto, a perfectly round shaped cove, where it is possible to observe several halokinetic sequences in the Late Jurassic. Here, the shaly limestones and sandstones near the diapir contact are steeply dipping and fan away into gently dipping red sandstones and grey marls defining five unconformities.

The São Martinho do Porto seascape invites us for dinner, before returning to Peniche.

