



## NERC Centre for Doctoral Training in Oil & Gas (2017 start)

<b>Project Title: The effects of Salt Tectonics in the evolution of a Fold and Thrust belt</b>
<b>Host institution: Imperial College</b>
<b>Supervisor 1: Prof Rodney Graham</b>
<b>Supervisor 2: Dr Lidia Lonergan</b>
<b>Additional Supervisor (s): Dr Jean-Claude Ringenbach (Total), Professor Jean-Paul Callot (University of Pau), Professor Rob Butler (University of Aberdeen)</b>

### **Project description:**

The fold and thrust system of Haute Provence is well known but although previously recognised, the role played by salt diapirism in its evolution has not been studied from a modern perspective. The science of salt tectonics has seen massive advances in the last ten years or so, partly because of the importance of salt in the exploration of the Gulf of Mexico and the modern seismic data and analogue modelling which went along with that exploration. Armed with this experience it is possible to revisit onshore areas with similarities to the Gulf of Mexico - even well-known ones- and gain remarkable new insight into both the geological evolution of the regions themselves and salt behaviour in general. Both fold and thrust belts and salt tectonic provinces are very much 'challenging environments' for hydrocarbon exploration and exploitation.

Salt tectonics has played a role in every phase of the evolution of the Provence fold and thrust belt and also in the extensional episode which preceded it. Compressional episodes since the Late Cretaceous have modified salt-related structures (including a canopy) of Jurassic age, influenced deep water sedimentation of the early foreland basin (including, perhaps, the main Grès d'Annot depocenter itself) and led to the formation of well exposed mini-basins in the later terrestrial stages of the foreland basin evolution. Two well-known lineaments may be lateral salt welds, there are massive accumulations of Triassic breccia which may be cap rock, and the complex structures at the Valensole foreland basin edge which may be related to diapirism or salt glaciers rather than thrusting. None of these problems have been properly investigated.

Detailed field mapping and section building in areas already known to the supervisors will specifically target these problems in regional context, and palinspastic restorations from the Jurassic onwards will be worked out and assembled in three dimensions. Particular emphasis will be on structures at the margins of mini-basins (requiring reference to seismic data from the Gulf of Mexico), on a detailed investigation of the sedimentary response to developing structures, and on the nature of salt welds.

### **CDT Research theme(s):**

Directly addresses the theme of 'challenging exploration environments' since the research area is a fold and thrust belt and the project is directly relevant to subsalt exploration.

### **Research context:**

The areas of structural geology sedimentology and basin analysis. The ability to visualise structural development associated with salt movement is *the* fundamental skill required for successful salt trap definition and the understanding of petroleum generation and migration in areas like the Gulf of Mexico or – of great current interest - the Gulf of Campeche.

**Research costs:** Air fares to Marseille ca £200 return maximum three times a year (£600). Car hire maximum £1000 per year. Accommodation ca £1500 for a three-month field period. Total £3300 per year. Expect to do 3 seasons in four years so require £9900 in total

**Career routes:** Exploration Geoscience, prospect definition and analysis, structural geology in complex areas.