

Valleys on the back of mountain belts – how do hinterland basins form? A case study from the Tuscan Apennines, Italy

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Project description

The striking phenomenon of basin subsidence in close vicinity of emerging orogens has made hinterland basins a topic of debate amongst geoscientists for decades. From the Himalayas to the Andes, and the Apennines, hinterland basins form low lying, fertile plains on the back of orogens that are often heavily populated areas and have been the cradle of civilizations for millennia.

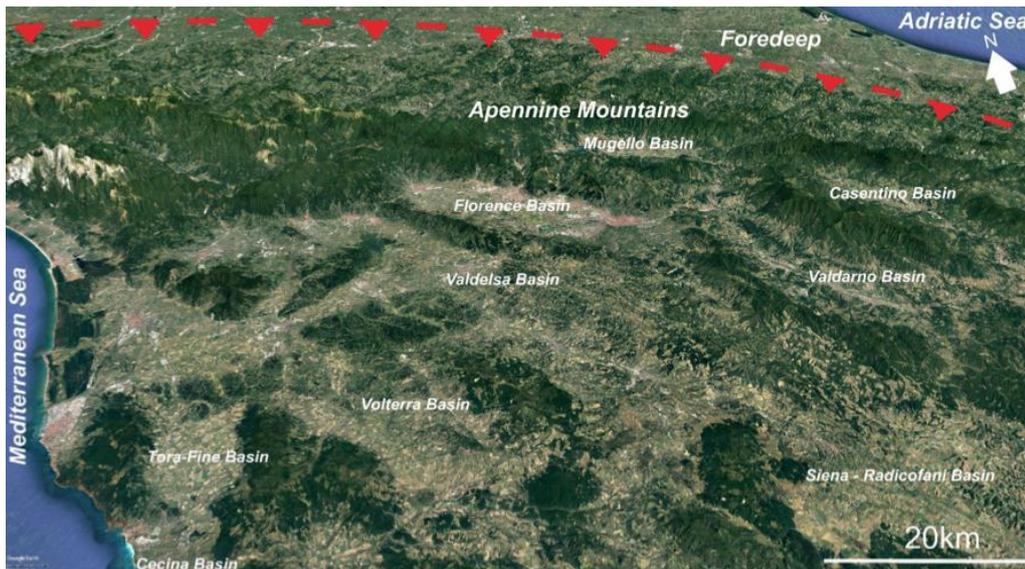
In contrast to the exposed and accessible nearby mountain slopes, hinterland basins are filled by a thick sedimentary cover, making their understanding challenging and limited to the assessment of the near-surface geology. Fundamental questions related to deep structural architecture of these basins and the geodynamic driving factors of their formation and infill are largely unanswered. Filling this knowledge gap would allow to better understand seismicity and availability of geo-resources in these regions, massively benefiting the communities living on the substrate of these basins.

The student will access a multi-scale spatial database containing seismic reflection profiles, well data, a catalogue of 2000+ earthquake events, and potential field data (gravity and magnetic) covering the Valdelsa basin, Tuscany (Italy). The database is held at Royal Holloway within a GIS capable, 3D geo-modelling system and will be immediately available to the successful candidate. The analysis of the data will allow the erection of a subsurface structural-stratigraphic model of the basin. Surface geological data will be acquired by the student through targeted field studies and will be used to “ground truth” inferences from the subsurface investigation. Integration of bottom hole temperatures and earthquake data in the geological model will provide the opportunity to assess seismicity and thermal regime of the basin. This would inform potential access to renewable energy sources in the basin as well as provide the foundation for a robust geohazard assessment of the region.

The nature of the research will provide the student with the opportunity to learn a variety of geological and geophysical interpretation techniques as well as to develop skills in integrating large and diverse datasets, surface and subsurface. The multi-disciplinary approach of the project will also suit PhD candidates willing to independently steer the research in the direction of field-based geological analysis, natural seismicity, tectono-stratigraphy or subsurface assessment of geo-resources.

Person specification

Applicants should have a degree in a geoscience subject relevant to the research, such as geology or geophysics. Prior experience in subsurface analysis would be considered an advantage.



References:

Benvenuti, M., Del Conte, S., Scarselli, N. and Dominici, S., 2014. Hinterland basin development and infilling through tectonic and eustatic processes: Latest Messinian-Gelasian Valdelsa Basin, Northern Apennines, Italy. *Basin Research*, 26(3), pp.387-402.

Benvenuti, M. and Degli Innocenti, D., 2001. The Pliocene deposits in the Central-Eastern Valdelsa Basin (Florence, Italy), revised through facies analysis and unconformity-bounded stratigraphic units. *Rivista Italiana di Paleontologia e Stratigrafia (Research In Paleontology and Stratigraphy)*, 107(2).

Horton, B. K., Busby, C., & Azor, A. (2012). Cenozoic evolution of hinterland basins in the Andes and Tibet. *Tectonics of sedimentary basins: recent advances*, 427-444.

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Application

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Closing date for applications to [Royal Holloway Direct](#): 7th January 2020

This project has been shortlisted for funding by the ARIES NERC Doctoral Training Partnership. Shortlisted applicants will be invited to interview in late February 2020.

Successful candidates who meet UKRI's eligibility criteria will be awarded a NERC studentship (in 2018/19 the stipend was £14,777). In most cases, UK and EU nationals who have been resident in the UK for 3 years are eligible for a full award.

For non-UK EU-resident applicants NERC funding can be used to cover fees, RTSG and training costs, but not any part of the stipend. Individual institutes may, however, elect to provide a stipend from their own resources.