

Sedimentary model of a Late Triassic salt giant in the Peruvian fold-and-thrust belt

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Summary

The Peruvian fold-and-thrust belt records a Late Triassic salt giant providing information of its lithostratigraphic distribution and depositional architecture. We show that the related evaporites were deposited in a basinwide setting with a sulphate platform and halite basin. Moreover, in the sulphate platform, petroleum features are found. Our study provides insights on deposition and sedimentary evolution of salt giants which can be relevant for hydrocarbon exploration.

Introduction

Salt giants are characterized by sedimentary basins with evaporite minerals covering an extensive surface (>100,000 km²) with hundreds to thousands of meters thick deposited in a range of tectonic settings (Rodríguez et al., 2018). Although, these deposits are related to hydrocarbon accumulations (Hübscher et al., 2007), there are still salt giants which their sedimentary models and lithostratigraphic architecture remain unknown. A case of salt giant where we are not aware of any studies regarding sedimentary models, lithostratigraphy and potential relationships with a petroleum system is located in the northern and central Peruvian fold-and-thrust belt. Here, evaporites were deposited during the Late Triassic period and subsequently deformed through different structural geometries, such as pillows, diapirs and canopies (Calderón et al., 2017). Moreover, related to these structures, ore targets exist (HANNAN METALS, 2020). The main aim of this presentation is to show the sedimentary model attributed to the Peruvian evaporites. We expect to provide insights on deposition, sedimentary evolution and petroleum systems associated to salt giants.

Method

We integrate field observations, thin-section descriptions, geochemistry and well-log analysis in conjunction with seismic reflection data from the Peruvian salt giant to obtain: (i) a lithostratigraphic distribution; (ii) a depositional architecture; and (iii) petroleum features.

Results

We show an anhydrite/gypsum thick (up to 700 m thick) succession with intercalated thin (up to 30 m thick) carbonate, containing dolostone, black shales and coarse siliciclastic intervals prevailing in external areas of the salt giant. To depozone area, halite abounds forming a thick body of up to 1100 m thick. The evaporites are sealed by a regional carbonate succession of up to 100 m thick. To the southeast, sulphates are missing and a thin (>250 m thick) succession of halite is recognized lying on a sub-salt serie. The anhydrite succession forms a wedge geometry

where layers of the halite body are overlapping. This fact suggests that these evaporites were deposited in a basinwide setting where a marginal sulphate platform was developed first to the northern part. Subsequently, halite was deposited in its central part sealing the sulphate platform and the sub-salt series to the southeast. The carbonates and shales intercalated into the anhydrite wedge contain local porosity and significant TOC (4%), respectively. Carbonates and shales intercalated in a salt giant from northern Europe have been recently documented as producer reservoirs and source rocks (Patruno et al., 2017). We consider that the Peruvian salt giant is analogue to the Europe case. Moreover, the so-called Otto Fiord Formation (Sverdrup Basin, Canada) might relationships to these cases.

Conclusion

The Peruvian salt giant was deposited in a basinwide characterized by a sulphate platform and halite basin. The platform is formed of petroleum features, such as reservoirs (in dolostones) and source rocks (in shales). Our study could be relevant to better understand hydrocarbon potential of other salt giants.

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