Seismic Characterization of Thermal Regime in the Luderitz Basin Offshore Namibia

Arka Dyuti Sarkar[1], Benedict Campbell[1], Mads Huuse[1]

[1]School of Earth and Environmental Sciences, University of Manchester, Manchester, United Kingdom.

ABSTRACT

The Luderitz Basin offshore Namibia is a frontier deep water basin where the lack of exploration drilling leaves significant questions regarding source presence and maturity. The best source of temperature data with which to conduct maturity analysis and subsequent basin modelling is borehole measurements, but where no drilling has occurred alternative methods are required. Previous work has outlined the possibility of using Bottom Simulating Reflectors (BSRs), by defining the base of gas hydrate stability above free gas, as the basis for thermal gradient calculation. This paper presents a refined workflow for present day thermal modelling in support of frontier exploration and drilling decisions utilising heat flow derived from BSRs and thermal conductivity from velocity data. The workflow has been applied to a high quality 3D seismic volume from the Luderitz Basin. ODP data have been used to ground truth the geophysical estimations in the distal parts whilst an exploration well calibrates the proximal geotherm. Bulk overburden velocity has been used to calculate the BSR thickness. A shallow geothermal gradient averaging to 5.6 oC/100m has been calculated utilising this BSR thickness and corresponding temperature differential with the seabed. Under a max thermal conductivity envelope of 0.8 Wm-1K-1, derived from the nearby ODP results, outputs shallow heat flow ranging between 0.040 – 0.054 Wm-2. This gives an average BSR derived heat flow of 0.045 Wm-2. Preliminary results indicate the Lower Cretaceous in the area in is the oil window.