Seismostratigraphy, tectonics and geological history of the Ninetyeast Ridge

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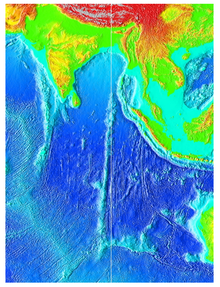

INTRODUCTION

The Ninetyeast Ridge (NER) is a 5000 km-long, aseismic volcanic ridge trending N-S in the Central Indian Ocean. It is widely accepted that NER formed as a hotspot track created by northward migration of the Indian plate over the Kerguelen hotspot during the Late Cretaceous and Early Cenozoic. Multibeam bathymetry data and multichannel seismic profiles collected over the NER at seven sites between 5.5N and 26.1S during cruise KNOX06RR of RV Roger Revelle with the participation of P.P. Shirshov Institute of Oceanology supplemented ideas about its seismostratigraphy and tectonics to clarify geological history [Sager et al., 2007].

RESULTS AND DISCUSSION

Multibeam bathymetry data and 2D multichannel seismic data clearly show active faulting along the entire length of the NER. Bathymetry data collected in the cruise shows significant changes of NER's morphology. It changes with latitude - from large, individual seamounts in the north segment to smaller, linear, narrow seamounts and ridges in the central segment to high, nearly continuous, and often highly asymmetric with a steep eastern slope and low western slope ridge in the south. Theese distinct morphological segments are characterized by different internal tectonic structure (faults geometry). The faults have different directions for each segment of NER - they trend to NW-SE less NE-SW in the northern segment, E-W in the central segment and NE-SW in the south. Large near E-W grabens mostly filled by intensively deformed sediments are widespread along the ridge (Fig.1)

Additional features were traced within the sedimentary cover of NER as a result of seismic stratigraphy analysis of the multichannel seismic data collected in proximity to DSDP and ODP drill holes (Sites 758, 216, 214, and 253) - eight reflectors: 0, 0A, 1, 1A, 2, 3, 4 and 5 and three seismic complexes: the lower subaerial–shallow-water, medium intermediate and upper deep-water (Fig. 2) [Marinova, 2012].

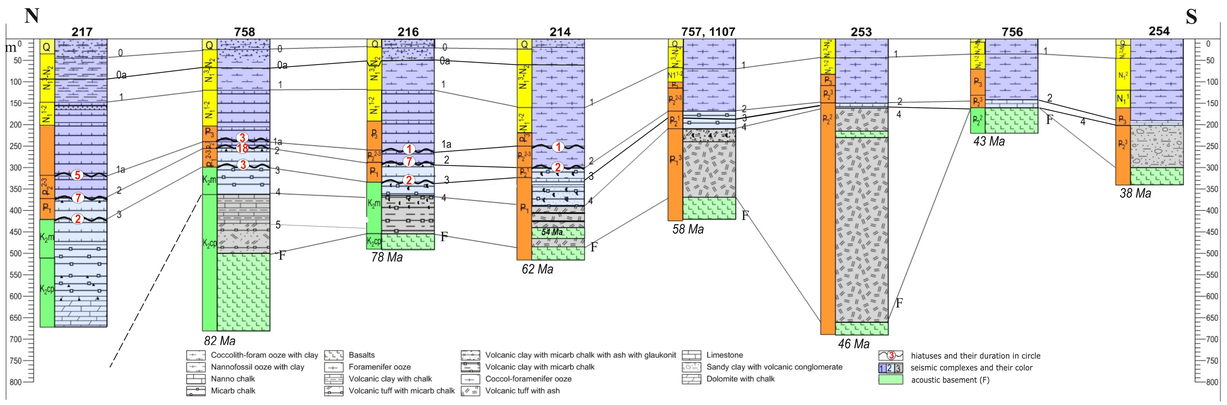

Fig 2. Correlation scheme of seismic and ODP/DSDP drilling data

CONCLUSIONS

Multibeam bathymetry data and 2D multichannel seismic data clearly show active faulting along the length of the NER. Main unconformities and gaps marking by distinct reflectors were formed due to reorganization of tectonic or oceanographic regime and changing of sedimentation conditions.The three seismostratigraphic complexes reflect different stages of the NER evolution. Seismostratigraphic estimation of faulting age assume three phases tectonic activity of the ridge during the Paleocene, Eocene, and Late Miocene. The complex morphology of the Ninetyeast Ridge is controlled by interaction of many factors: its original fabric and tectonic history, position of the Kerguelen hot spot with respect to the Wharton spreading centers, variable hot spot magma output, active faulting etc.

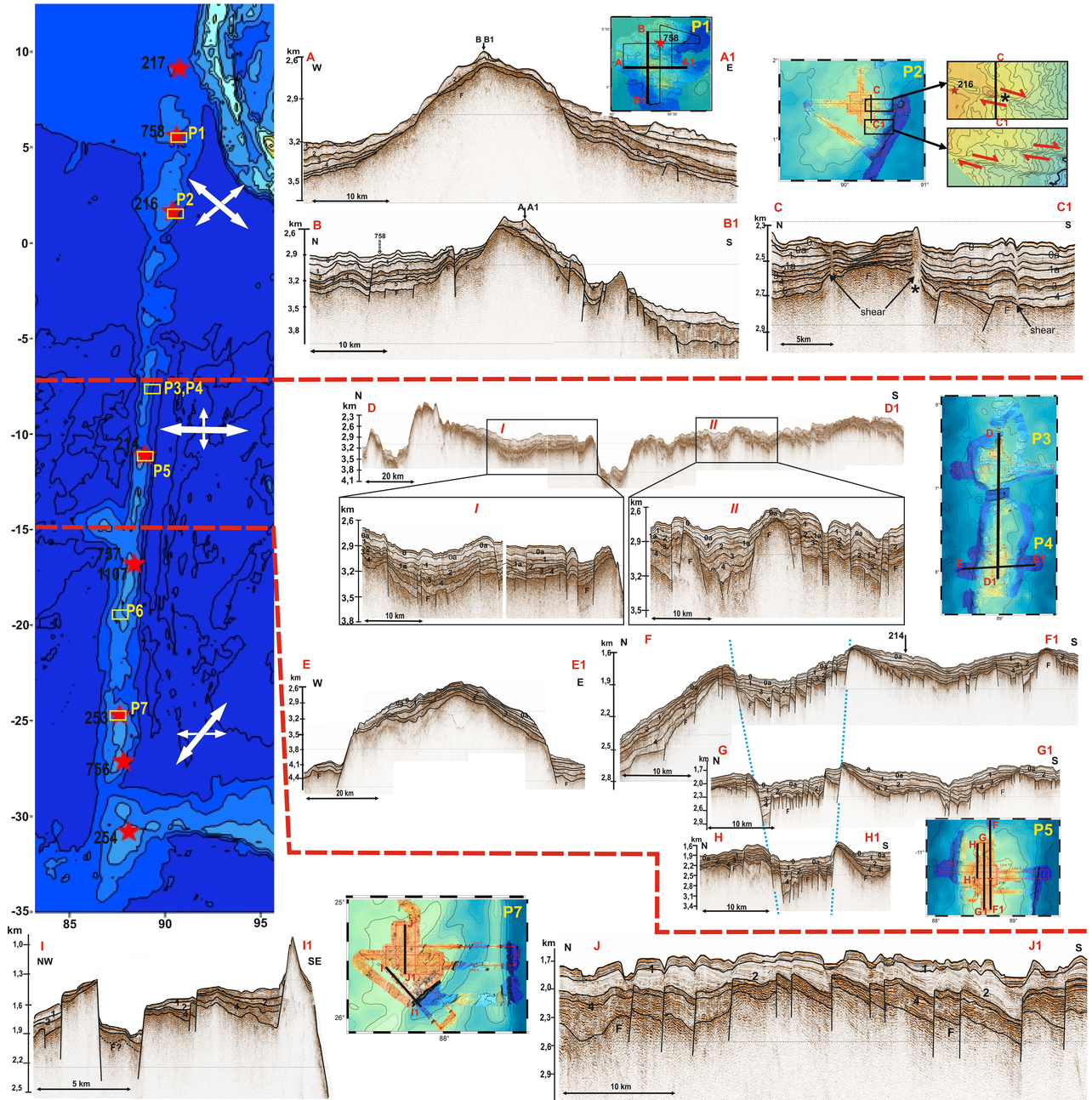

Fig. 1 Morphological segmentation of NER (northern, central and southern part) and typical seismic profiles for each.(white arrows on bathymetric map show main fault directions for each segment; red stars - sites ODP/DSDP; P1-7 - polygons with seismic survey)

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ACKNOWLEDGMENTS

The study and the first author attendance at the EGU General Assembly 2016 are supported by the Russia Foundation for Basic Research (grant 16-35-60023, 14-05-00395)