

Preliminary Results of Marine Heat Flow Measurements across the Eastern Flank of the Adare Trough, Antarctica: Possibility of Hotter-than-normal Asthenosphere?

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Abstract

The Adare Trough, one of the West Antarctic rift system, is known to form with seafloor spreading on a limb of a ridge-ridge-ridge triple junction between the Australia, East Antarctica and West Antarctic plates based on magnetic anomaly pattern. It was active from some time before chron 20 (43 Myr) to chron 8 (26 Myr), and is currently a fossil rift valley. Spreading rate since chron 20 is different in the eastern and western flanks (7 and 5

mm/yr, respectively), however, we do not know reason for an asymmetric spreading. In the ridge setting, marine heat flow measurement could be the first step to resolve this issue because it can directly show the current state of thermal regime of the asthenosphere. During the recent Korean RVIB Araon's Antarctic Expedition (ANA05B; Dec 12th 2014-Feb 25th 2015), we made an attempt to measure heat flow using 5-m long Ewing-type heat probe at five stations across the eastern flank of the Adare Trough along with the RVIB Palmer 9702

line, however have collected data only at three stations due to harsh conditions. As a preliminary result, observed heat flow values are significantly higher than estimated ones with the GDH1 model, suggesting that various possibilities of the asthenosphere including hotter than normal asthenosphere below at least the eastern flank of the trough. It is certain that more observations and analysis are required to attest hypotheses, and thus we plan to collect supplementary data in the upcoming Araon's Antarctic expedition in 2016.

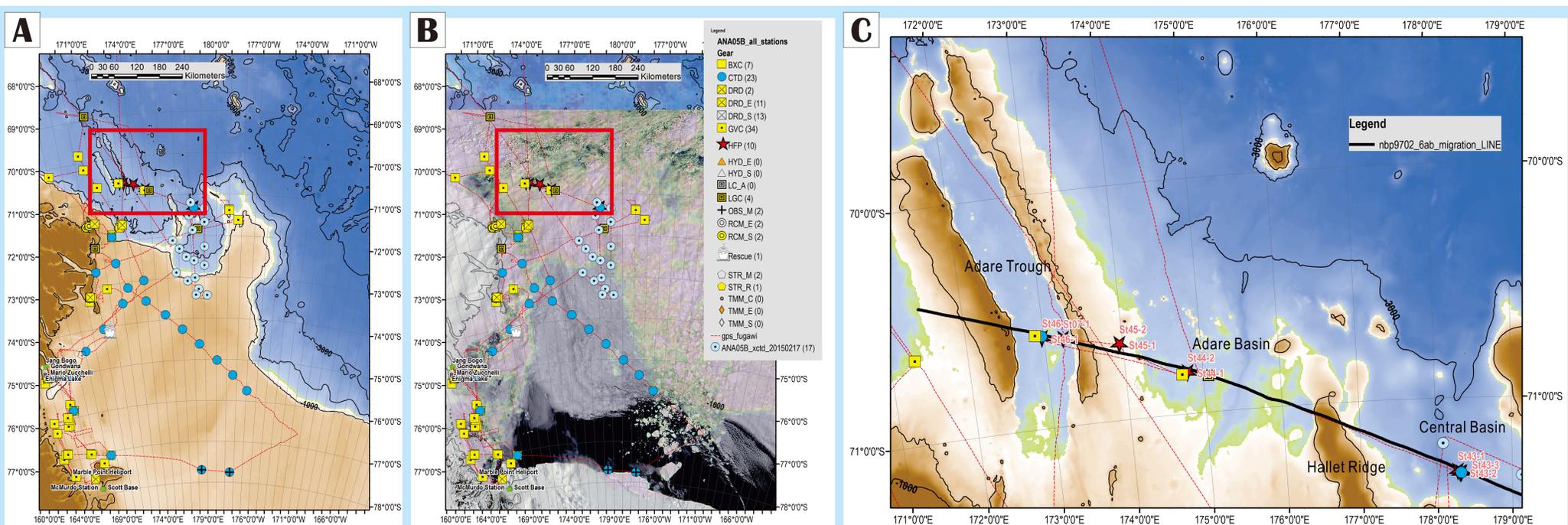
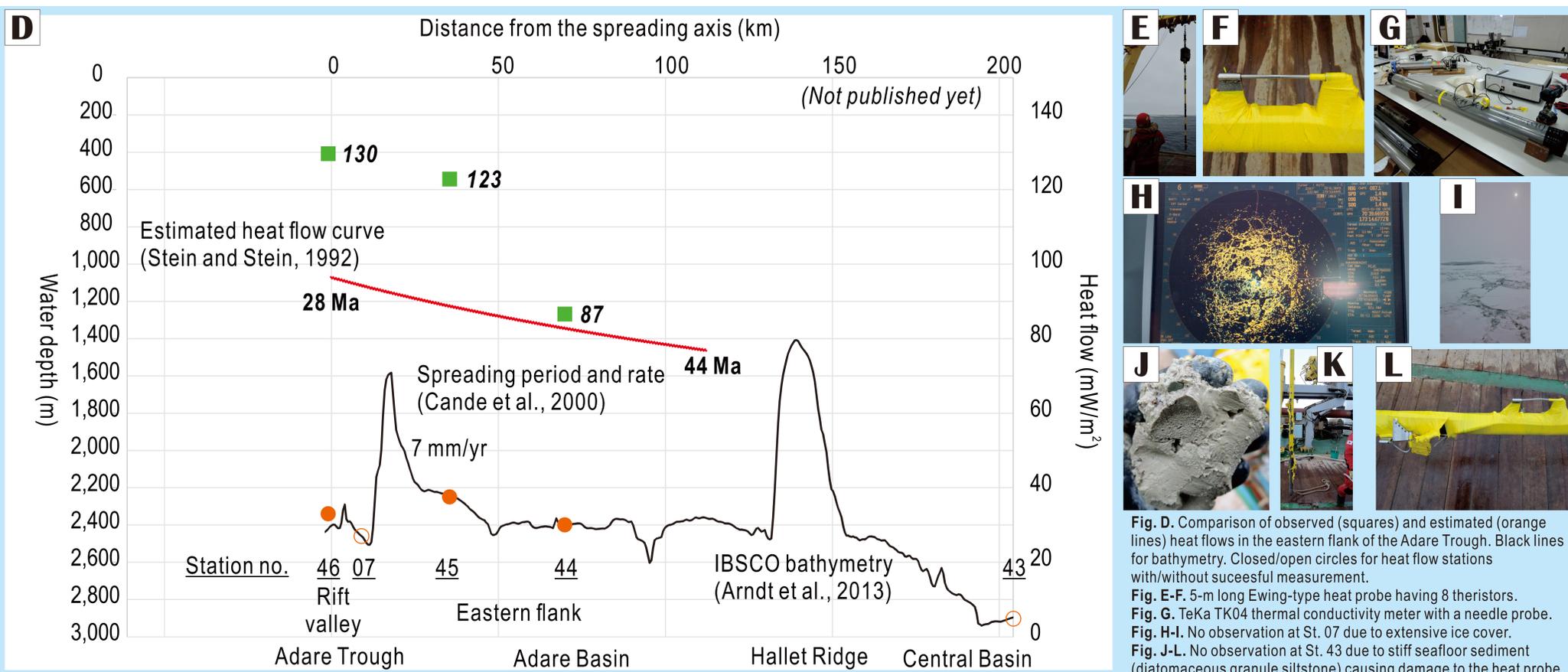


Fig. A. Station map of the ANA05B Expedition (Dec 12 2014 - Feb 25 2015)
Fig. B. Sea ice maps on 9th Jan, 2015 on the occasion of heat flow measurements. Sea ice maps are from satellites: concentration by AMSR2, and image from AQUA.
Fig. C. Stations for heat flow measurements (stars). Black line for NBP9702 line of which rift valley and flank areas were interpreted by Müller et al. (2005).



Possible reasons for the higher observed heat flows than estimated ones

- Secondary heat sources (advective vertical fluid, volcanic intrusion)
- High temperature of the asthenosphere
- Measuring errors

Future plan

- More measurements in the upcoming ANA06C Expedition (Feb - Mar 2016).
- Further literature survey

References

- Arndt et al. (2013), The International Bathymetric Chart of the Southern Ocean (IBSCO) Version 1.0 - A new bathymetric compilation covering circum-Antarctic waters, Geophysical Research Letters, 40, 3111-3117.
- Cande et al. (2000), Cenozoic motion between East and West Antarctica, Nature, 404, 145-150.
- Müller et al., (2005), Crustal structure and rift flank of the Adare Trough, Antarctica, G-cubed, 6, Q11010.
- Stein and Stein (1992), A model for the global variation in oceanic depth and heat flow with lithospheric age, Nature, 359, 123-129.

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