

# GEOTRACES Indian Ocean Activities

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# What is GEOTRACES?

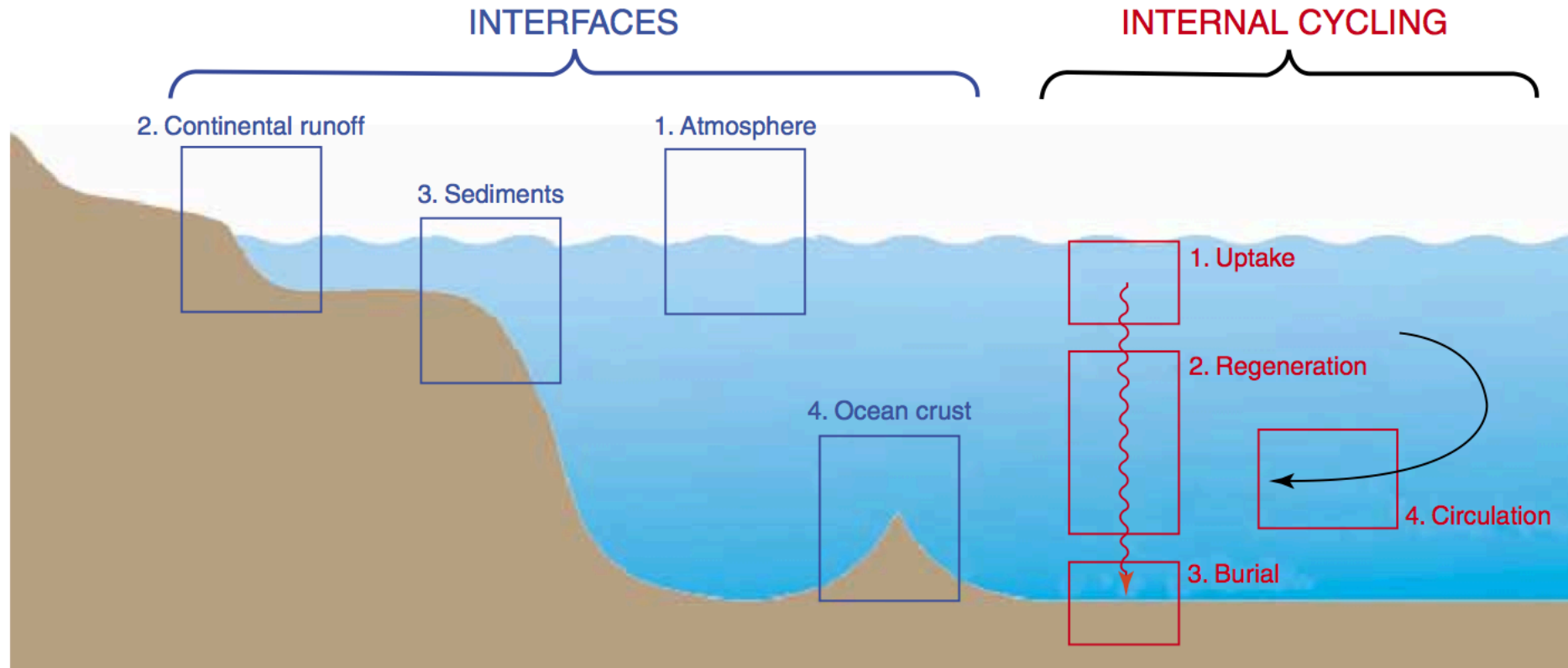
An international program designed to study the marine biogeochemical cycles of trace elements and their isotopes.

Its Mission is:

“To identify processes and quantify fluxes that control the distributions of **key trace elements and isotopes** (TEIs) in the ocean, and to establish the sensitivity of these distributions to changing environmental conditions”

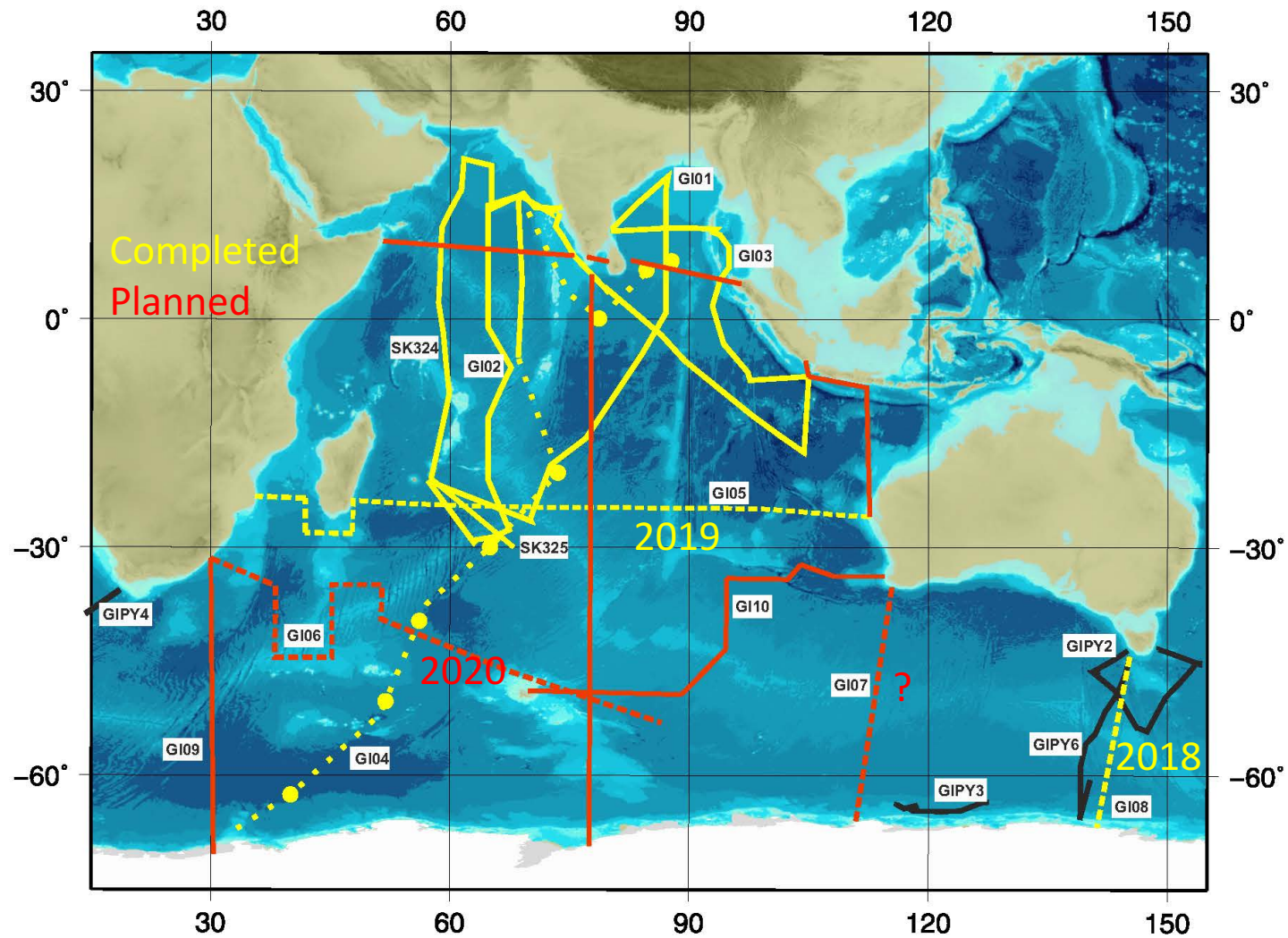


# The overall GEOTRACES Science Driver



All of these need to be examined and quantified in the Indian Ocean via section and process cruises

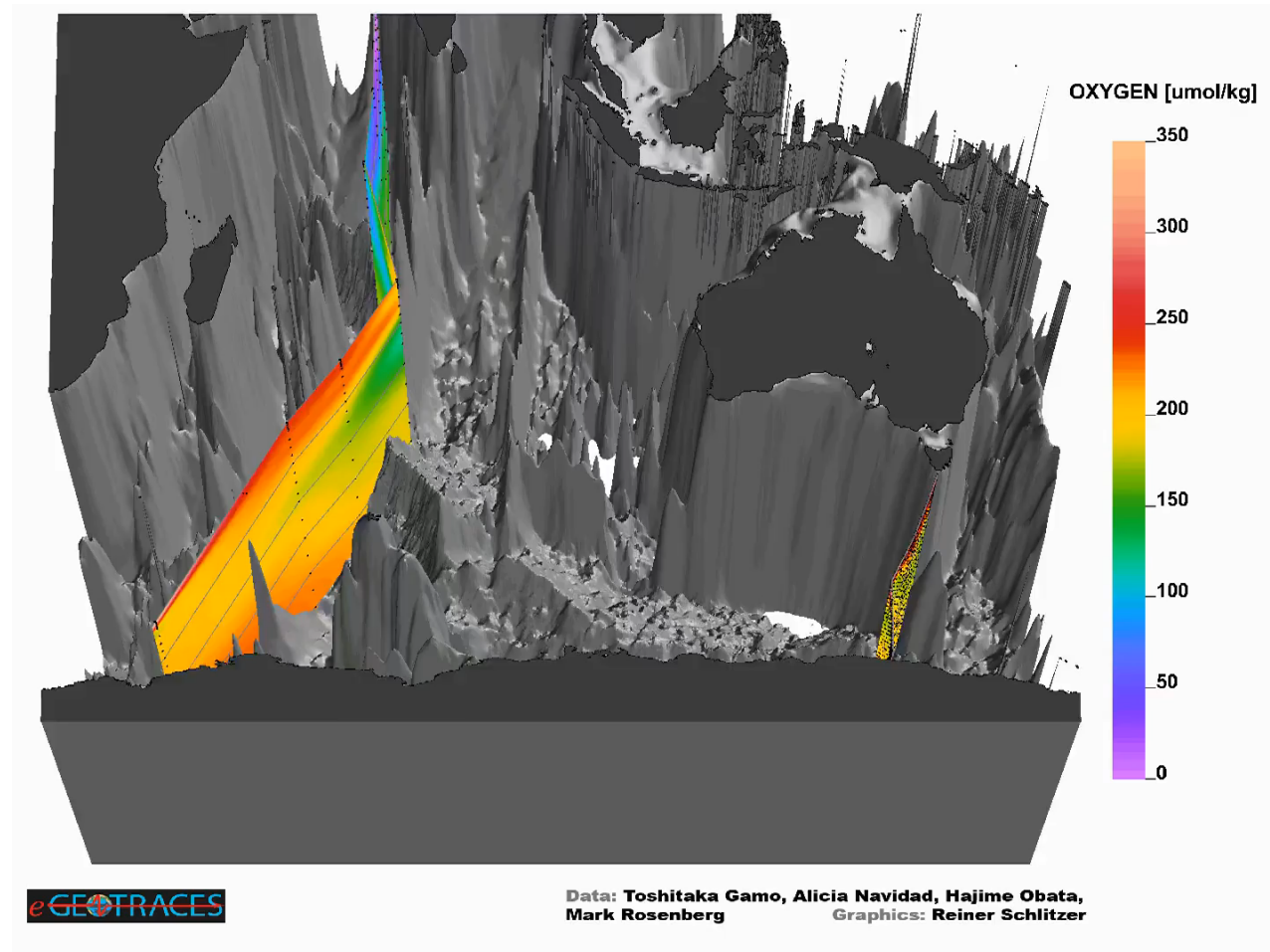
# Indian Ocean GEOTRACES Sections

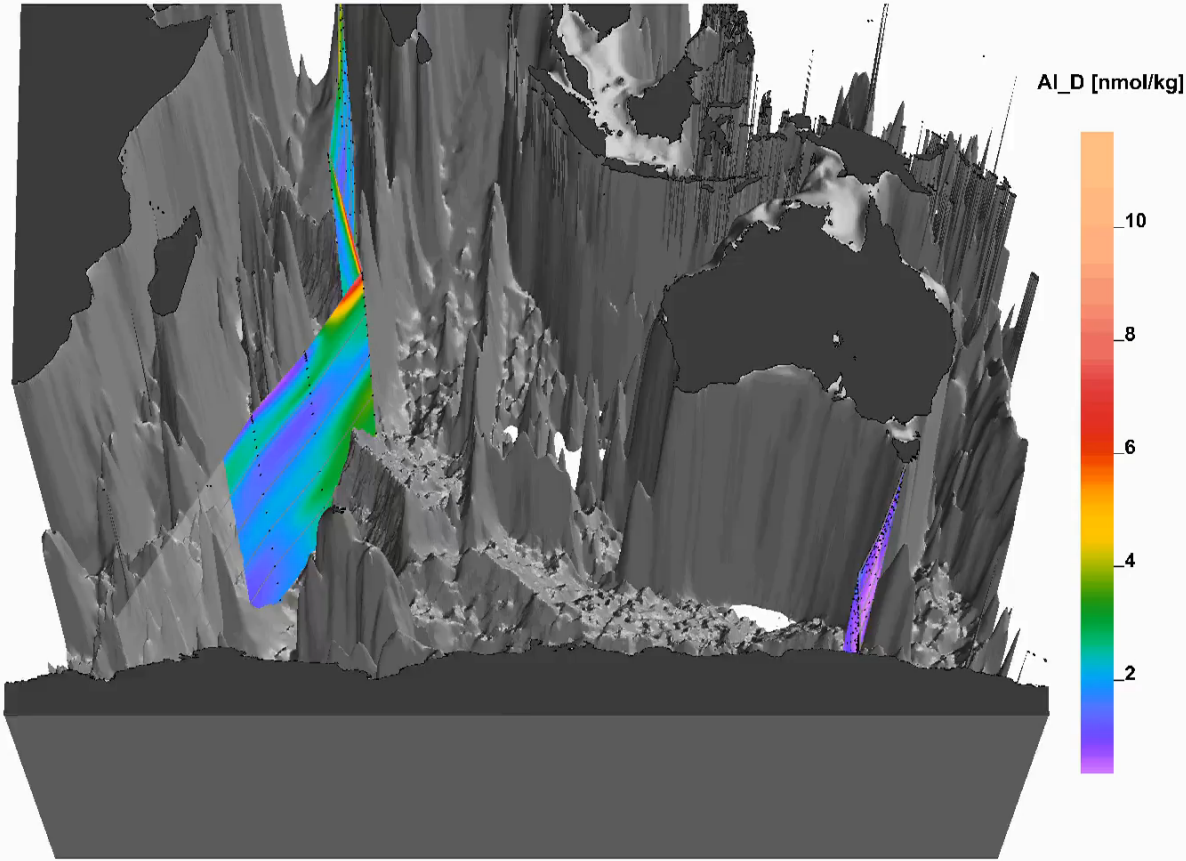


# Summary of GEOTRACES in the Indian Ocean

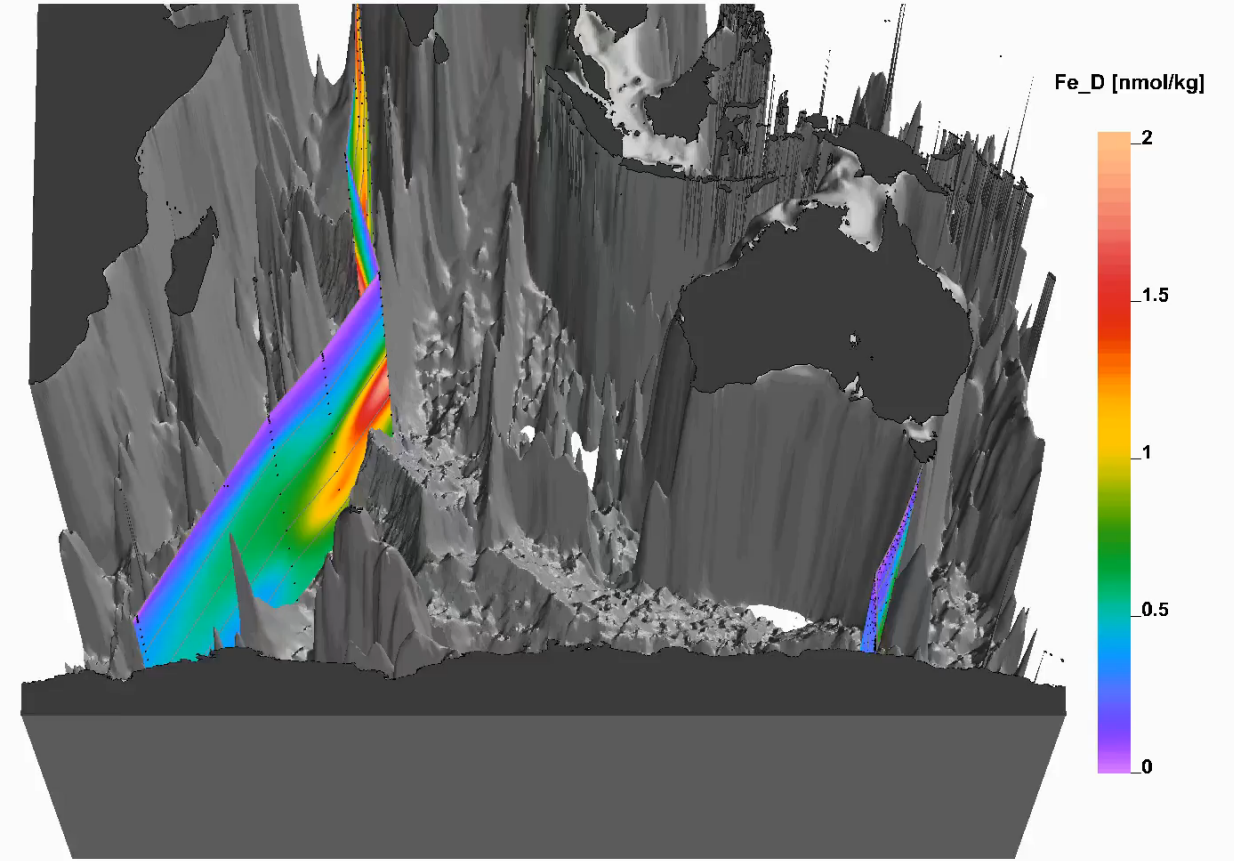
- Section Cruises: A total of 10, 6 completed to date
- Process Cruises: 7 to date, 5 in the Southern Ocean and 2 in the Arabian Sea
- Indian Ocean data presented in just-released 2017 GEOTRACES Intermediate Data Product

# Some GEOTRACES Results in the 2017 Intermediate Data Product

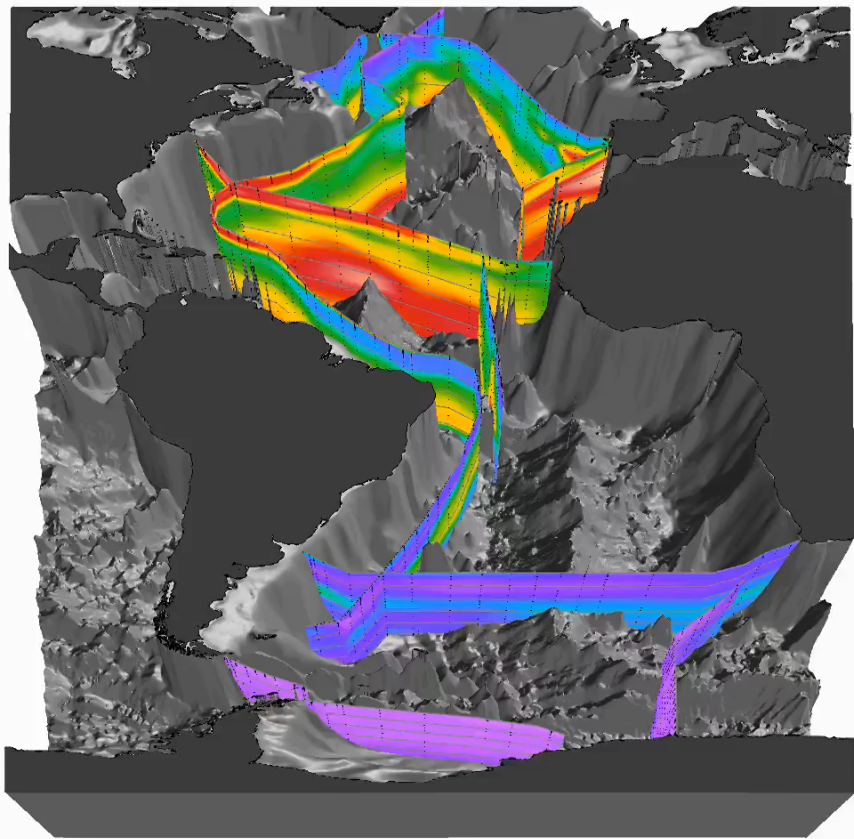




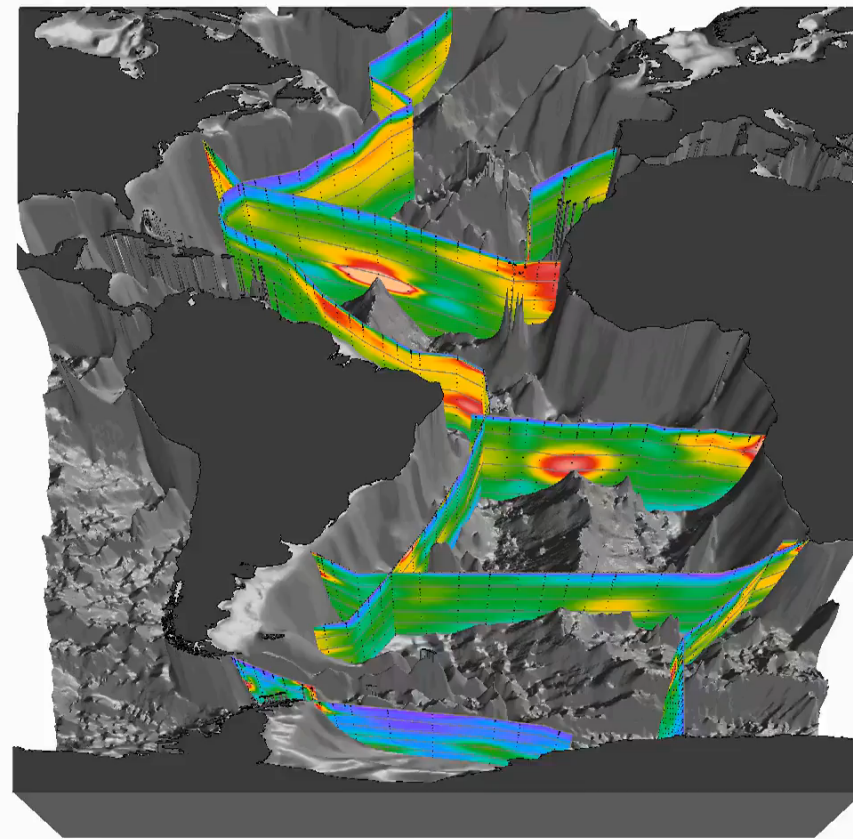
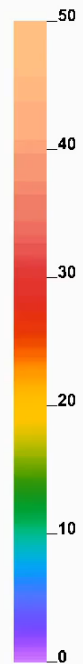
Data: Andrew Bowie, Edward Butler, Tomas Remenyi, Yoshiki Sohrin, Huong Thi Dieu  
Graphics: Reiner Schlitzer



Data: Andrew Bowie, Jun Nishioka and Hajime Obata  
Graphics: Reiner Schlitzer



Al\_D [nmol/kg]



Fe\_D [nmol/kg]





# GEOTRACES Studies Provide:

- Full GO-SHIP quality hydrography, nutrients, and oxygen
- Concentrations and distribution of key trace elements and isotopes including: Al, Fe,  $^{13}\text{C}$ , Cd, Cu, Mn, Nd isotopes, Pb isotopes,  $^{15}\text{N}$ ,  $^{232}\text{Th}$  – all in dissolved and particulate phases and aerosols
- Other parameters such as  $^3\text{He}$ , CFCs,  $^{234}\text{Th}$ , Ra isotopes, and  $^{14}\text{C}$  depending on cruise
- Using these and other variables: estimates of air/sea, hydrothermal, and continental margin fluxes, rates of internal cycling such as regeneration rates and particulate fluxes
- All data are publicly available, most within 6 months to maximum of 2 years