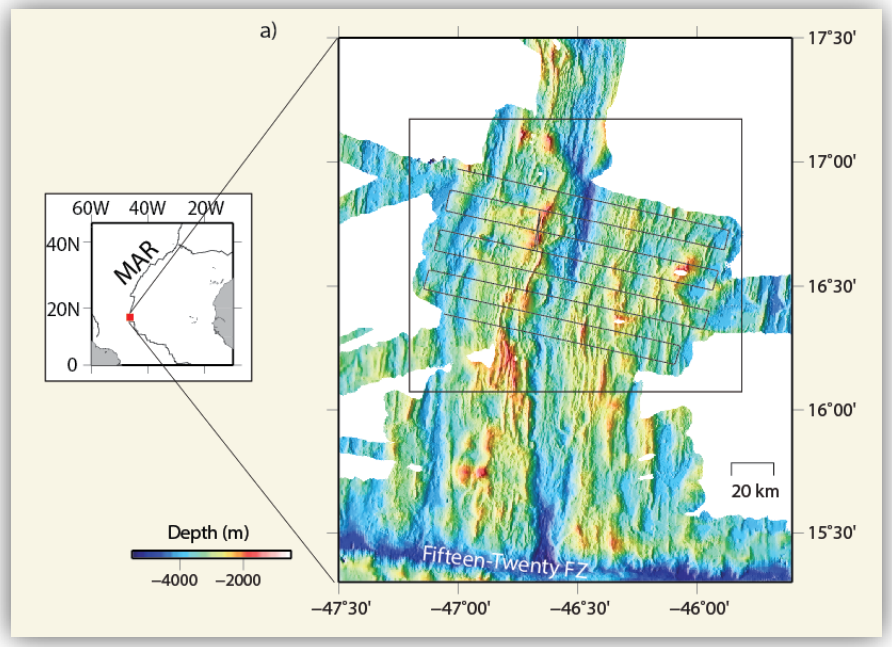
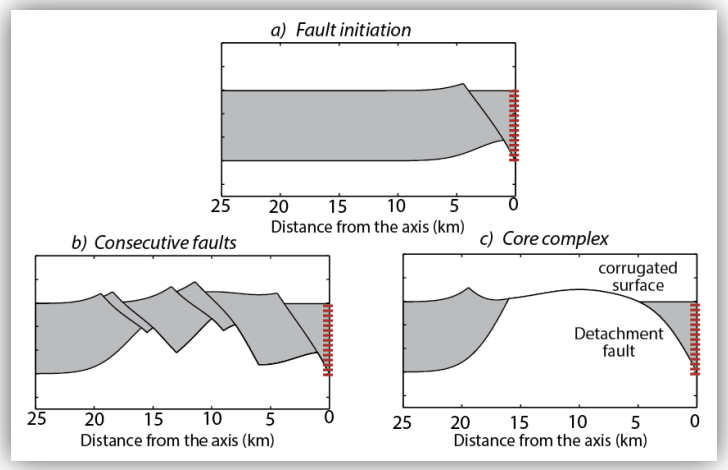
Development of detachment faults at intermediate magma supply

R/V Knorr Leg 210-05, 14 May -19 June 2013 co-PIs: D. Smith, H. Schouten, H. Dick (WHOI)

Study area: 16.5N



What is a detachment fault?

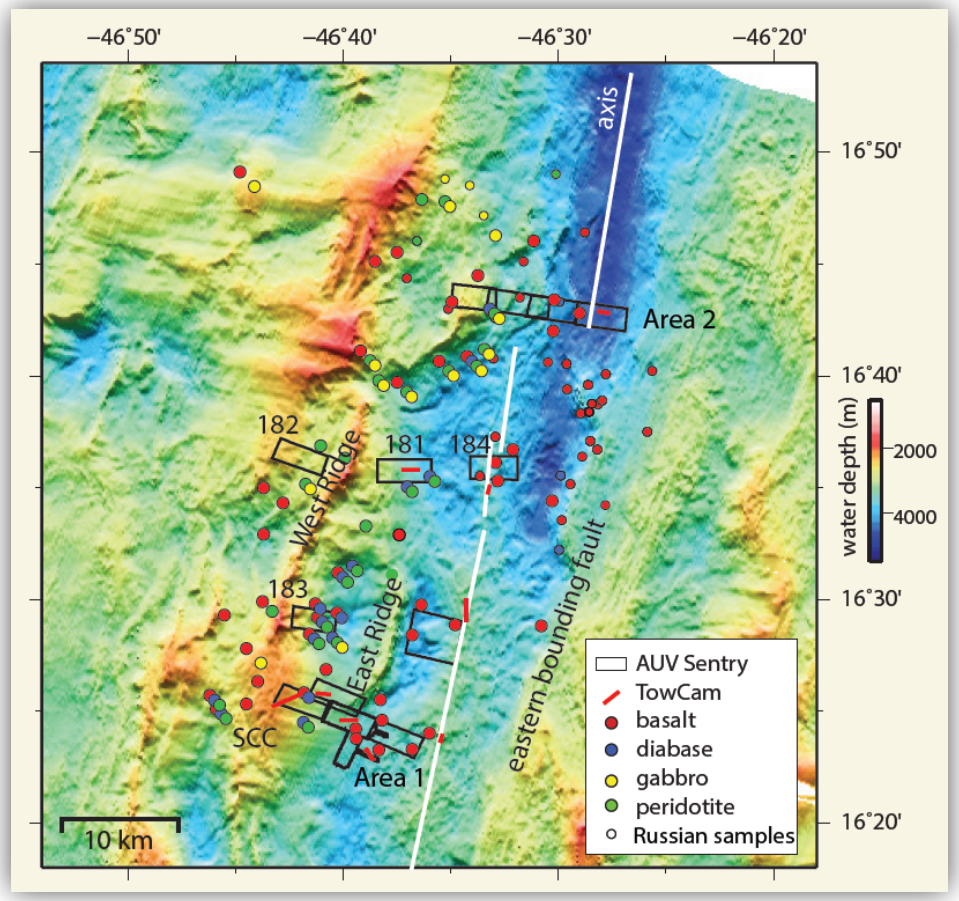


A long-lived fault that brings deep seated rocks to the seafloor and may show distinctive corrugations on the exposed footwall.

Goals of the cruise:

1) To understand the processes controlling the formation and evolution of detachment faults that may extend for millions of years.
2) To examine the relationship between magma supply to the ridge axis and detachment fault formation. Most models indicate detachment faults form when magma supply is low.

Data collection

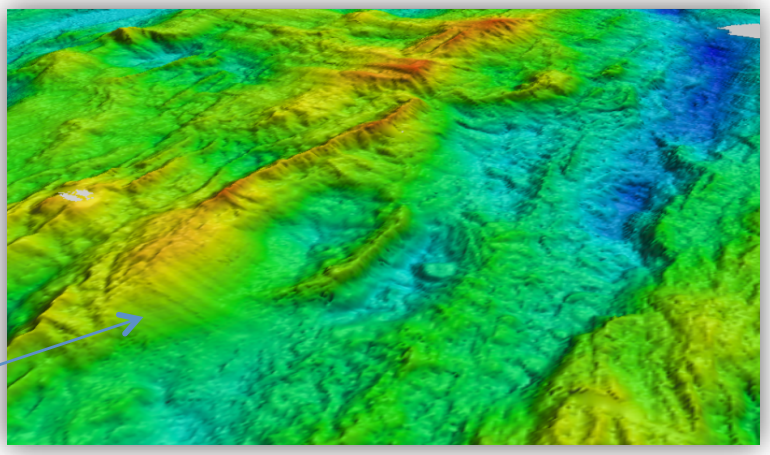


- Regional survey: SeaBeam bathmetry, magnetics, and gravity data

- 14 AUV Sentry dives: Reson 7125 multibeam bathymetry, sidescan (125 kHz and 400 kHz), Edgetch chirp, magnetics, water column data

- 9 TowCam dives: photographs, water column data

- 73 rock dredges

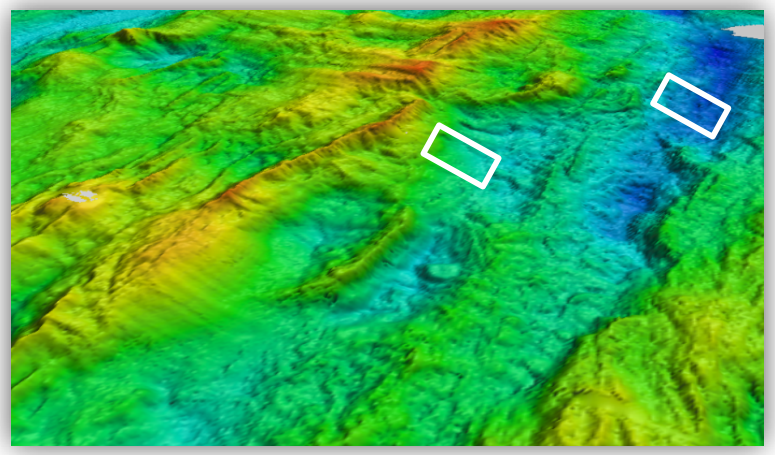


Corrugated fault

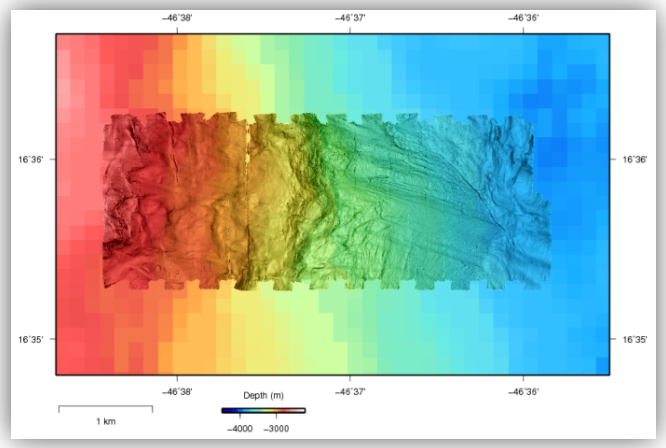
Axis

Sentry data

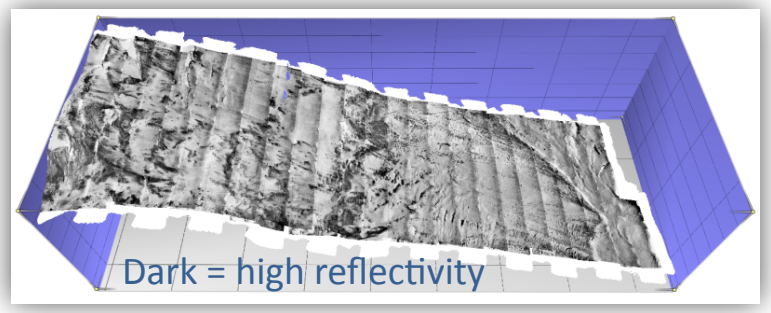
SeaBeam bathymetry



Sentry bathymetry on SeaBeam bathymetry



Sentry sidescan on bathymetry



Conclusions:

-- The surface expression of long-lived detachment faulting is variable

-- The relationship between magma budget (as expressed by volcanic products erupted at the axis) and detachment faulting is not straightforward.

Volcanism at 4500 m

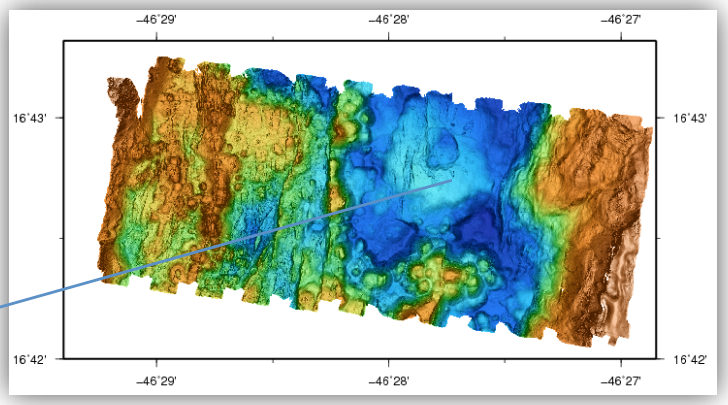


Photo from Cratered flow