REFLEX: Deep Carbon Reservoirs, Fluxes and Experiments

**Goal**
To advance understanding of the deep-Earth carbon cycle from atomic to global scales

**Science Plan**
- Deep Earth carbon reservoirs (mantle reservoirs, diamonds, C-O-H fluids)
- Deep Earth carbon fluxes (hi-res mapping input & output fluxes)
- Deep Earth carbon chemistry (P-T-X lab experiments, mantle samples)
REFLEX: Deep Carbon
Reservoirs, Fluxes and Experiments

• What are the pathways of carbon exchange between the surface and deep Earth, and what are the fluxes along those pathways?

• What are the chemical forms of carbon in the deep Earth?

• How variable is the carbon abundance of the Earth’s interior?

• How rapidly does carbon exchange between the surface, mantle and core – and how are the surficial and deep carbon cycles linked?

• What are the interactions between the deep carbon cycle and the dynamics of the Earth’s interior?

• What are the ultimate origins of Earth’s carbon?
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- What are the pathways of carbon exchange between the surface and deep Earth, and what are the fluxes along those pathways?

Carbonate in Oceanic Crust
56 Tg/yr @ 1% CO$_2$

Measured Volcanic CO$_2$ ~5 Tg/yr

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What are the chemical forms of carbon in the deep Earth?

- hydrocarbons, fluids, melts, silicate minerals, C phases
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- How variable is the carbon abundance of the Earth’s interior?
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• How rapidly does carbon exchange between the surface, mantle and core – and how are the surficial and deep carbon cycles linked?

• What are the interactions between the deep carbon cycle and the dynamics of the Earth’s interior?

• C phase stability
• C influence on physical properties
• tracing C variability
• tracing core-mantle-surface exchanges
What are the ultimate origins of Earth’s carbon?
REFLEX: Deep Carbon Reservoirs, Fluxes and Experiments and the role of ocean drilling

- Assembly, error analysis and data mining of IODP data on carbonate and organic carbon content in deep-sea sediment cores. Data is available via NGDC.

- Analysis of well-recovered cores penetrating basaltic basement, and evolution of CaCO₃ addition (age, temperature).

- Deep drilling of accretionary prisms in subduction zones; determination of carbon flux from pore fluid release.

- Recovery of a complete section of oceanic crust, for full understanding of CaCO₃ addition throughout the depth of the crust.