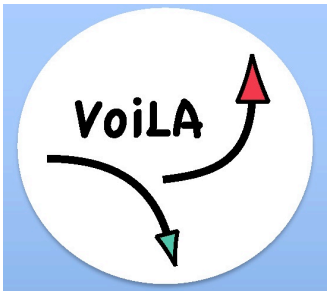

Everyone has probably heard of the water cycle at the Earth's surface, where the exchange happens between the sea and the atmosphere via evaporation, cloud formation and rain. However there is also a water cycle *within* the Earth, where the exchange happens between the sea and the solid Earth. The most important step in this lesser-known cycle is when water trapped in the oceanic crust is returned to the deep interior at subduction zones as part of the plate tectonic cycle. As the sinking plate heats up and gets squeezed a large fraction of the incoming water is "sweated off" and added to the overlying mantle where it causes melting. These melts feed volcanoes above which are dangerously explosive. This activity, combined with the earthquakes triggered by the plates scraping past each other and the consequent tsunamis and landslides, makes subduction zones the most hazardous places on Earth. Yet these regions also have benefits: the cocktail of fluids travelling with the melts concentrates valuable metal deposits and the fine ash erupted by the explosive volcanoes produces nutrient-rich, fertile soils.

The aim of the NERC VOILA (Volatile cycling in the Lesser Antilles arc) research programme is to take a holistic approach to the cycling of volatiles (water, along with other volatiles such as carbon dioxide and sulphur) into the deep Earth at the Lesser Antilles subduction zone. Here the North American plate, soaked with water from the Atlantic Ocean subducts beneath the Caribbean plate. The project combines a range of Earth scientists with skills in petrology, geochemistry, numerical modelling as well as marine geophysics to track the passage of the water as it goes into and out of the subduction zone system.

Cruise JC133 contributes to Workpackage 2: Water Pathways from the Slab to the Arc of the VOILA programme. We will lay out an array of seismometers on the seabed to record distant earthquakes in order to image the wedge (area between the top of the underlying subducting slab and the seabed). We will use methods similar to medical X-ray imaging to determine the seismic velocity and attenuation structure and hence the pathways of the water and melt. The seismic array will also record local earthquakes from the scraping of the North American and Caribbean plates which will help regional hazard assessment and answer specific questions such as is there a link between the fluid pathways and the pattern of earthquakes?

The VOILA passive array is the largest of its type ever deployed at an Atlantic subduction zone. The instruments will sit on the seabed for about 15 months, when we will return to pick them (and their precious data recordings) up. We will then conduct further geophysical measurements to determine the pattern of water on the incoming plate in order to complete our understanding of this *interior* water cycle.

For further information see:
http://www.voila.ac.uk or
http://www.imperial.ac.uk/engineering/departments/earth-science/research/research-groups/geodynamics/themes/earth-structure/voila/