In order to understand the role of the tropical Atlantic for climate variability in the Atlantic region, this subproject aims at investigating the variability of the western boundary current (WBC) system off Brazil as well as the Atlantic Meridional Overturning Circulation (AMOC) at 11° S. The assessed variability will then be related to the variability of the Subtropical Cells (STCs) as well as AMOC variability at other latitudes.

**Observations of the WBC system:**
- The WBC system is investigated with ship-based observations and a mooring array (hydrographic as well as direct current observations).
- The variability of the WBC system, especially of the North Brazil Undercurrent (NBUC) and the Deep Western Boundary Current (DWBC) is investigated on time scales from intraseasonal to decadal.
- Deep Eddies, which have been shown to accomplish the transport of NADW instead of a laminar flow and were predicted to disappear with a weakening AMOC, are still present with similar characteristics (Fig. 1).
- The fourth cruise within RACE II (M130) was performed in September/October 2018, when the third period of moored observations (red box in Fig. 3) could be recovered with an instrument performance of over 90%.
- In addition to the reconstruction of the velocity sections from moored observations by interpolation and extrapolation (Fig. 3), the field will be reconstructed using a pattern regression method (Fig. 4). The reconstructed fields of the latter method can be directly compared to the observed fields and inferred transports of the shipboard observations.

**Aims during RACE II:**
- Assessment of the transport variability of NBUC, DWBC and the AMOC at 11° S on intraseasonal to decadal time scales
- Investigation of the relation between transport variability at the western boundary at 11° S (warm and cold water route) and the variability in the subpolar North Atlantic with respect to signal propagation within the AMOC
- Analysis of the spreading of water mass anomalies within the AMOC, which can e.g. originate from the variability in the inflow of saline waters from the Indian to the Atlantic ocean
- Investigation of the relation between NBUC variability at 11° S and EUC variability at 23° W, its impact on heat and freshwater balances of the mixed layer, resulting ocean-atmosphere interactions and rainfall variability over West Africa.

**Ekman transport variability:**
- Different wind products (NCEP/NCAR, QuickScat, CCMP, INALT01 wind stress) and observations (e.g. Fu et al., 2016) are compared at 11° S regarding the mean Ekman transport and variability on different timescales
- Seasonal variability is determined, but differs in amplitude between products
- Spurious decadal variability is found in NCEP/NCAR

**Variability of the AMOC at 11° S:**
- The mean, and seasonal to interannual variability of the AMOC at 11° S will be determined by constructing a transport time series from numerous observations.
- The AMOC can be calculated by the sum of four meridional flow components (following assumptions of the RAPID setup; e.g. Kanzow et al., 2010; Chidichimo et al., 2010):
  \[ T_{\text{AMOC}} = T_{\text{EKE}}(t) + T_{\text{NBUC}}(t) + T_{\text{EB}}(t) + T_{\text{UMO}}(t) \]
- Currently, the INALT01 model (Durgadoo et al., 2013) with a 1/10° nest in the South Atlantic, is used as “testing area”

**Fig. 5:** Vertical profile of transport per depth unit at 11° S from INALT01, every 50 days (grey) & averaged over 1978-2007. The zero-crossing represents the lower integration limit for the AMOC; a) Transport time series of the AMOC and its independent components.