French & German Ocean-Atmosphere component EUREC^{4}A-OA/++

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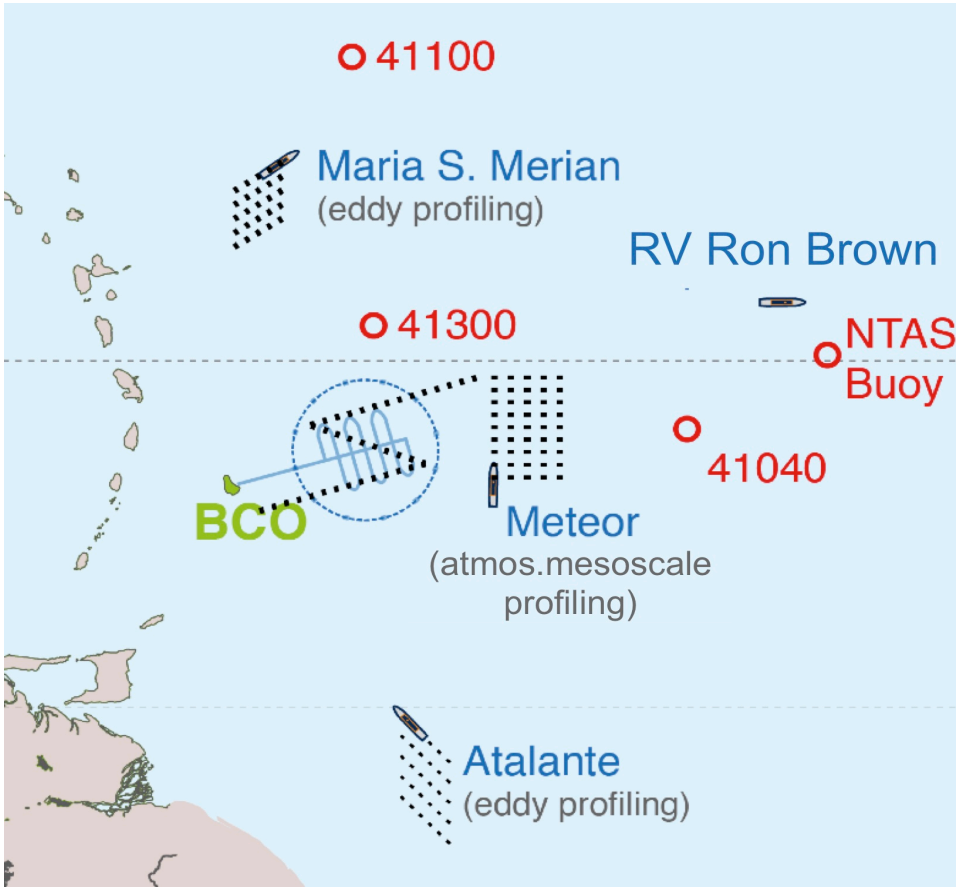
EUREC^{4}A-OA/++ Aims

The EUREC^{4}A-OA/++ project will take advantage of the international EUREC^{4}A intensive atmospheric field campaigns taking place during 6 weeks in January-February 2020 **to observe, simulate and advance understanding of mesoscale ocean eddies and atmospheric boundary layer features over the northwest Tropical Atlantic, their impact on the ocean structure (OBL), their contribution to air-sea interactions and the atmosphere shallow convection.**

EUREC^{4}A-OA/++ Aims

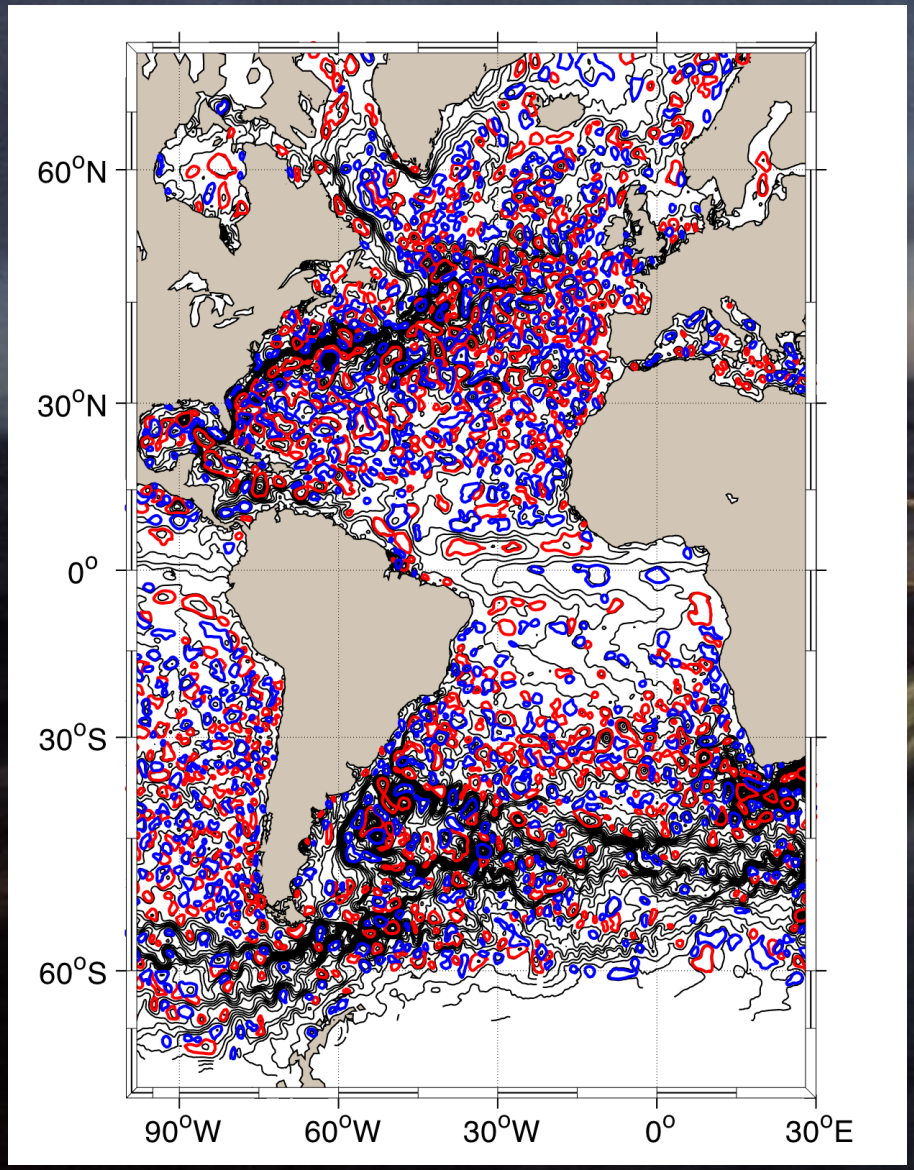


- To provide the large-scale atmospheric context for EUREC^{4}A (radiosounding)
- To lead oceanographic and ship-based atmospheric measurements (air-sea fluxes, upward looking instruments) including water isotopes, CO2 etc.
- Characterizing the variability of oceanic and atmospheric properties at the ocean mesoscale

EUREC^{4}A-OA Observations

- The Boreal drone (endurance of 10h/1000 km, Robert et al. 2017 La Météorologie) will be launched from Barbados island and during the ATR42/HALO flights to map SST, sea state and the surface energy and aerosol fluxes, and meteorological parameters near the ocean surface
- The international fleet of ships will intensively survey different mesoscale structures. These surveys will be carried out using gliders in addition to high-resolution CTD, RapidCAST, XBTs and underway observations of atmospheric and oceanic parameters including currents.
- Station point will be set in accordance with other EUREC^{4}A oceanographic campaigns to form a radiosondes network (with up to four soundings per day) in a region encompassing the core experiment area. This network will be used to derive a continuous temporal evolution (resolving the diurnal cycle) of the large-scale circulation and of the apparent heat source and moisture sink around the periods of the core experiment flights.
- Observations of water isotopes via a number of (F & USA) PICARROs

The ocean is a very turbulent fluid



Red = Anticyclones

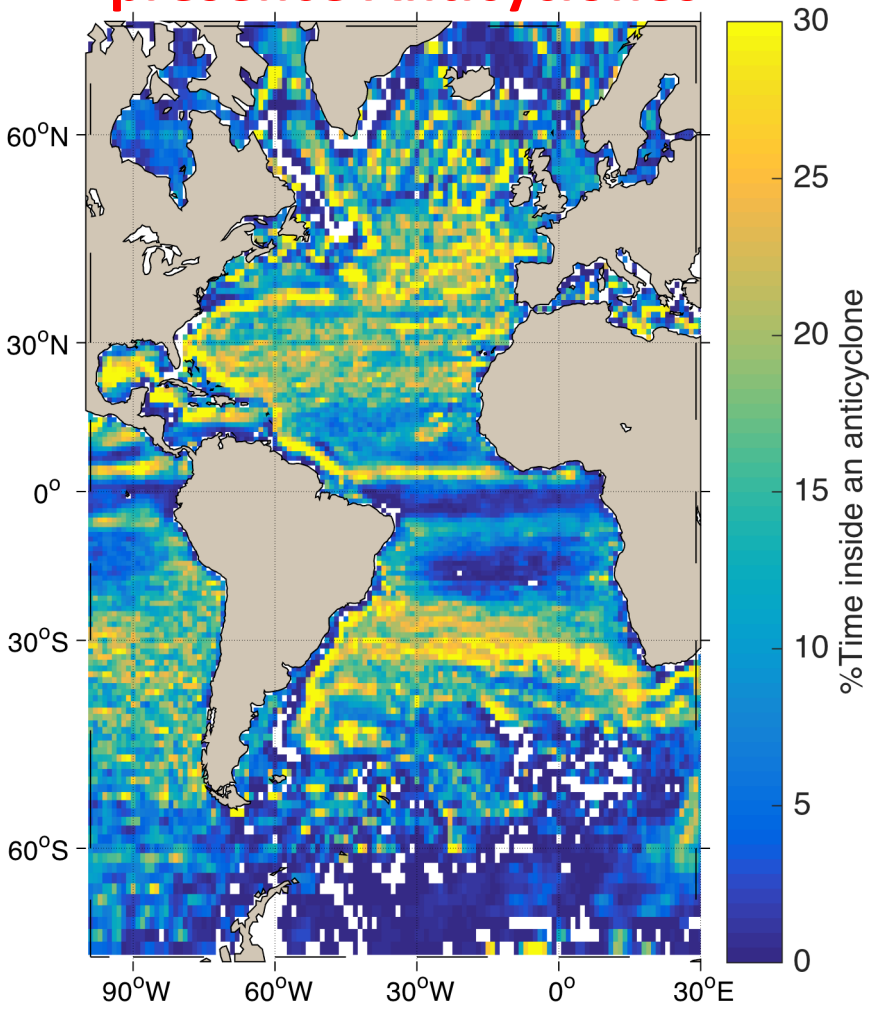
Blue = Cyclones

Eddy detection from satellite altimetry (1993-2017)
Laxenaire et al., 2017

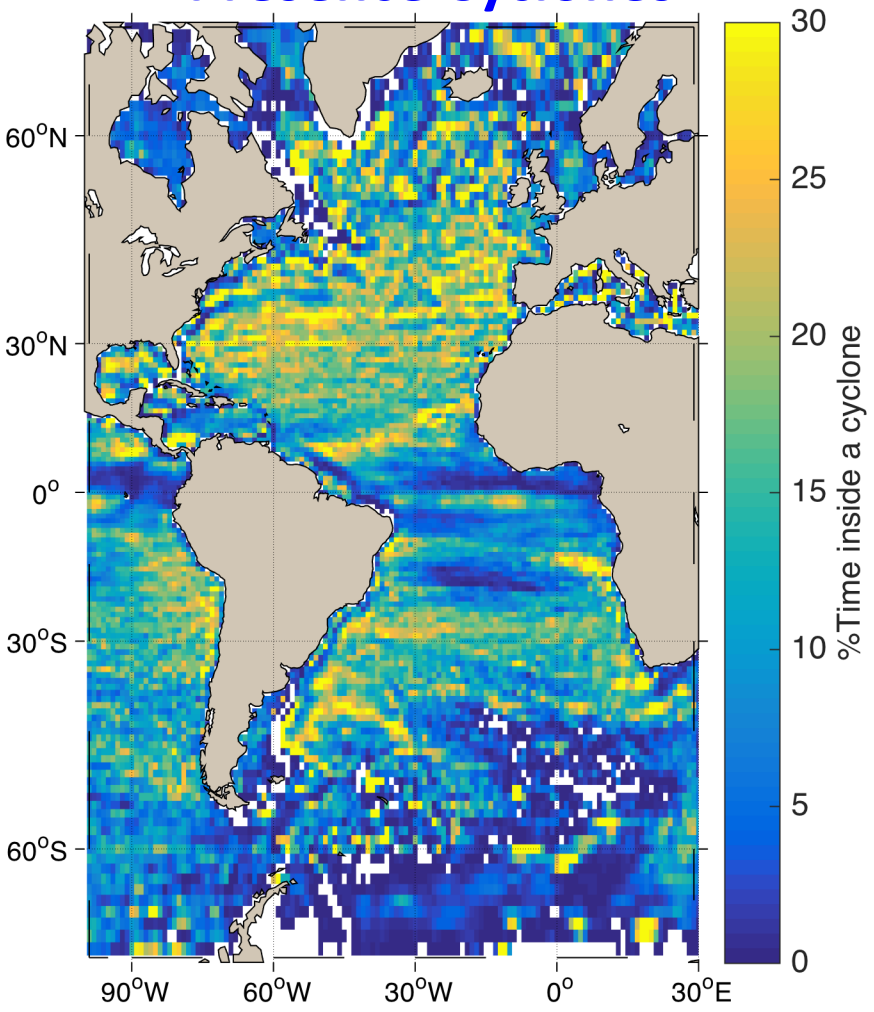
[AVISO Ssalto-Duacs Daily multi-satellite Maps of Absolute Dynamic Topography; Ducet et al., 2000; Pascual et al. 2006]

The ocean is filled by eddies

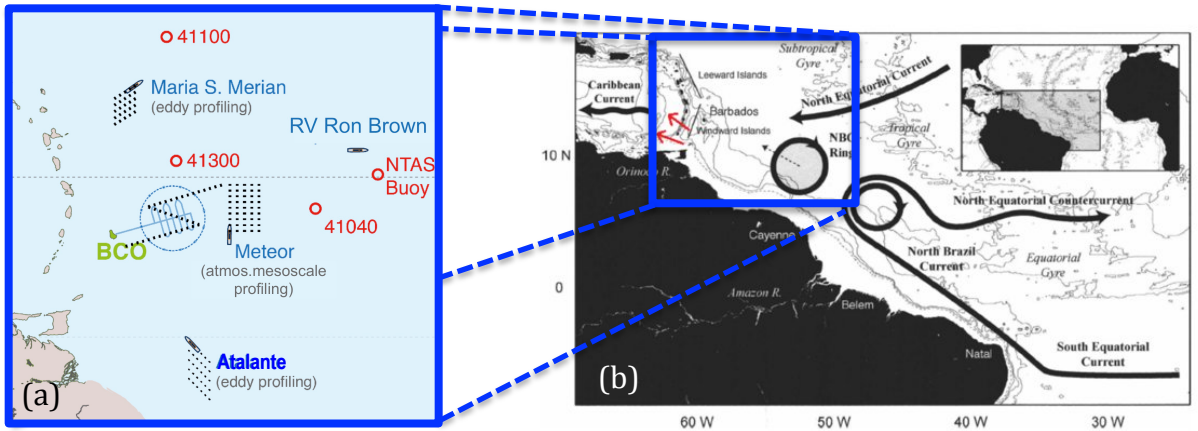
1°x 1° % Time of presence Anticyclones

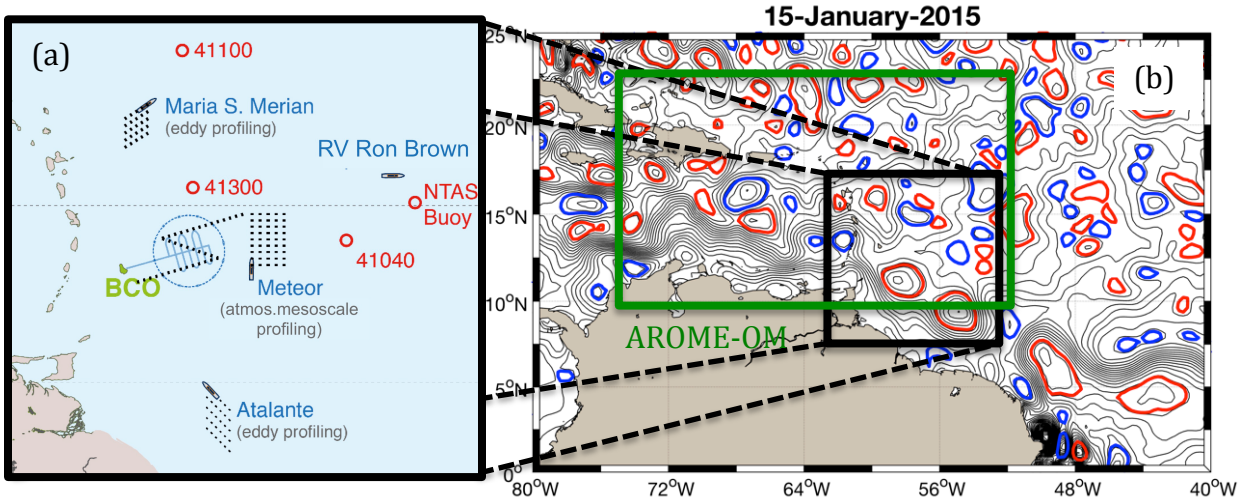


1°x 1° % Time of Presence Cyclones

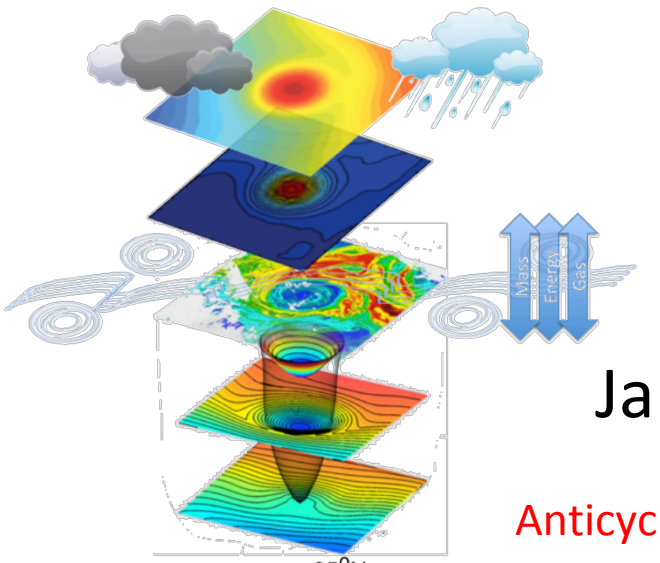


Ocean near Barbados: influenced by strong SST and SSS gradients, WBC & Mesoscale eddies





Mesoscale Ocean Dynamics & Air-Sea Interactions

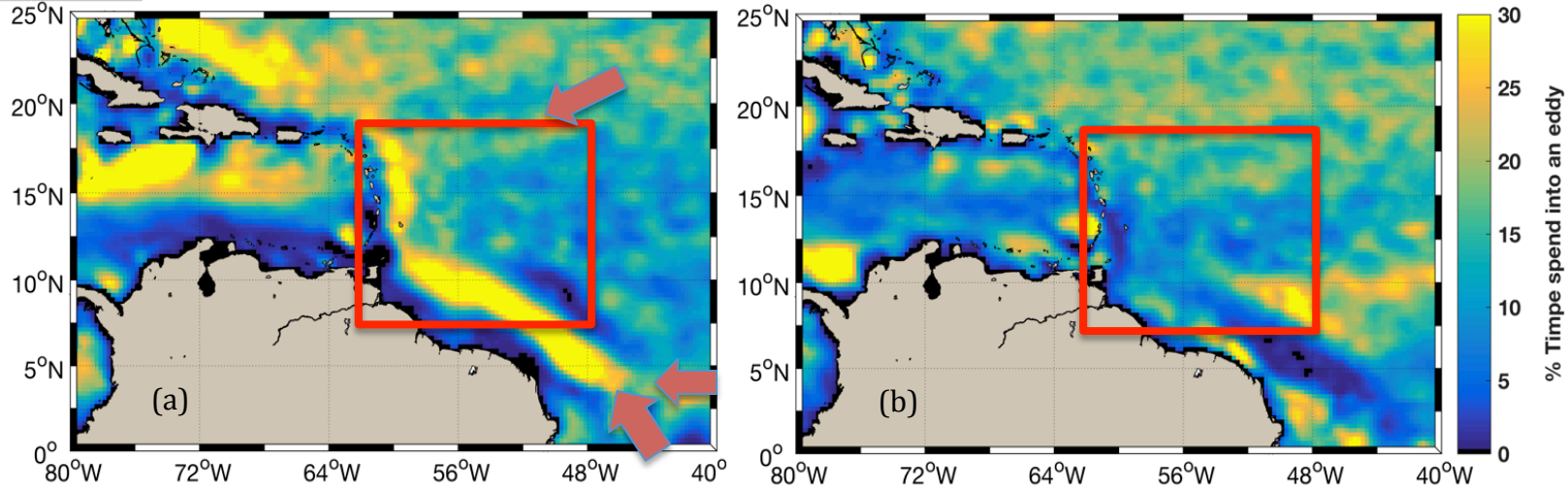


a) Cloud evolution experiment
b) Mesoscale eddy experiment

January Averaged Ocean Eddy Presence

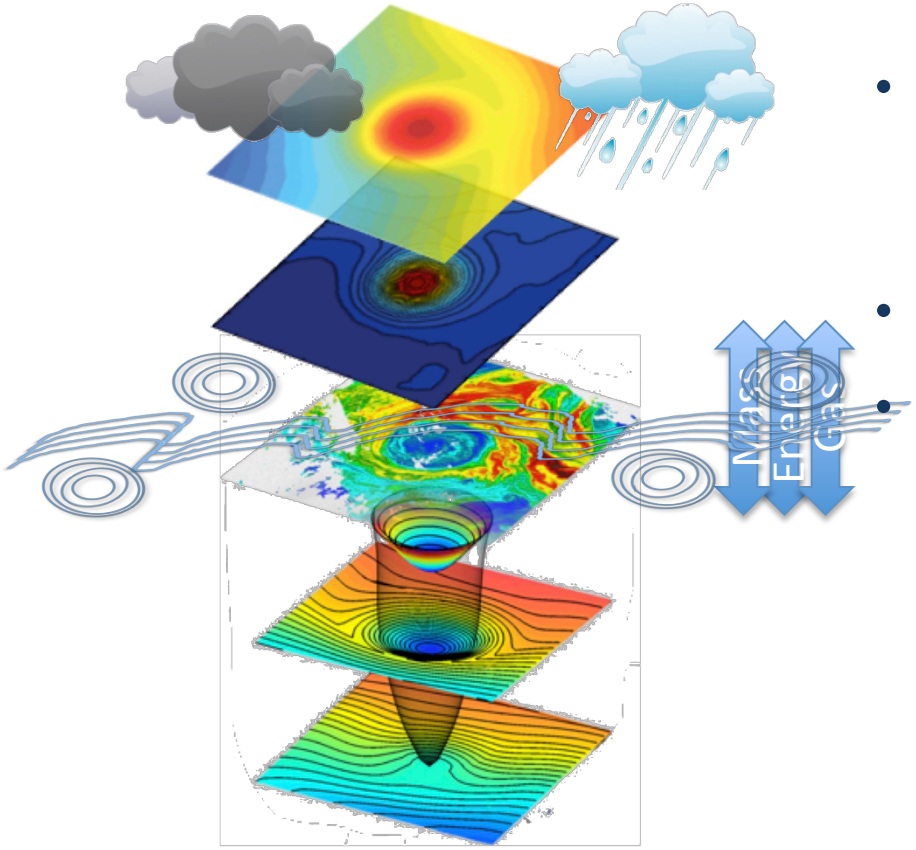
Anticyclones (Warm)

Cyclones (Cold)



Eddies, SST and air-sea fluxes I

Ocean eddies & influence on air-sea interactions

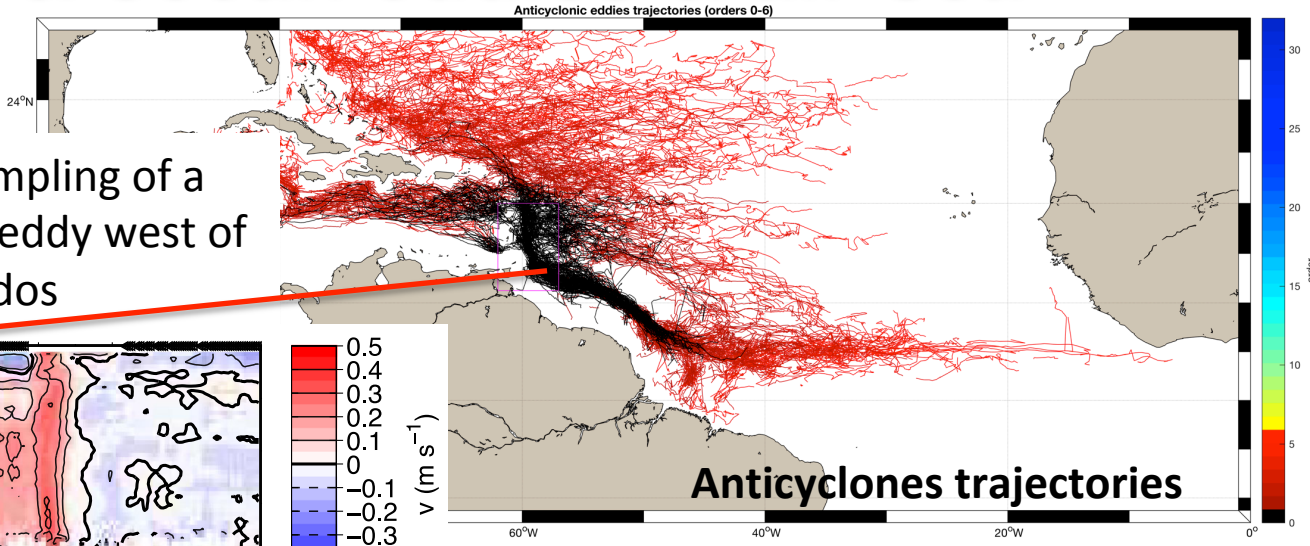


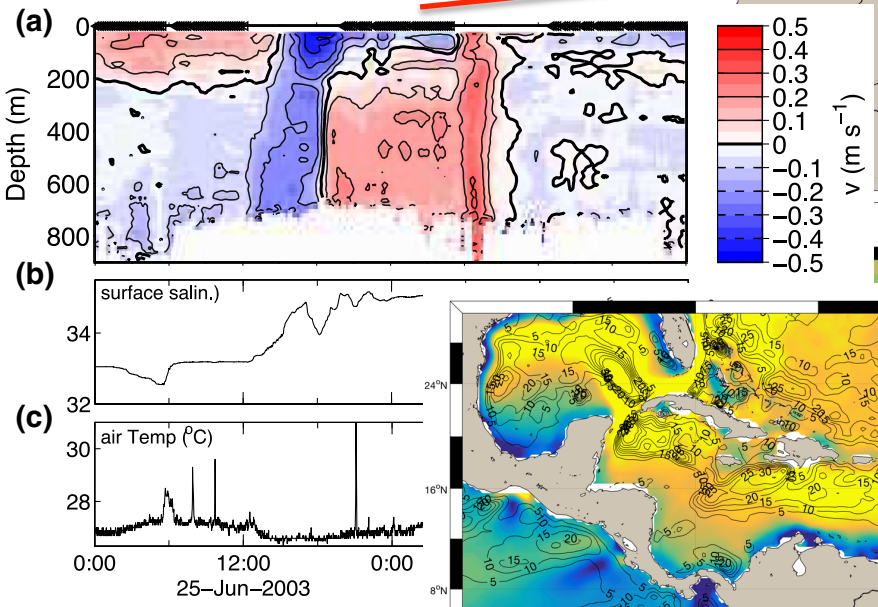
- Multidisciplinary observations of air-sea exchanges (in situ from ships, drones, from planes ...)
- Water isotopes wkith PICARRO
- Multidisciplinary observations of mesoscale eddies, including ocean gliders, turbulence profiling, biogeochemical observables

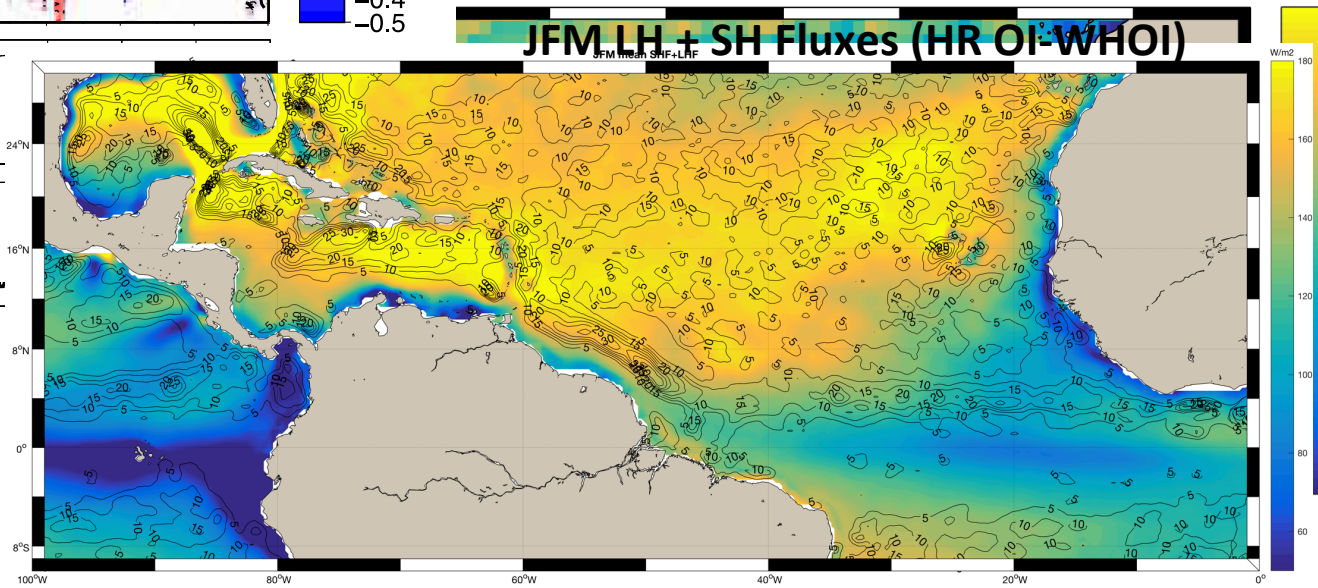
Besides direct link with EUREC4A objectives, ocean mesoscale eddiesare suspected to play the fundamental role in the anthropogenic heat and carbon sequestration, in tracer advection and in shaping marine ecosystems.

EURC⁴A & ocean eddies & air-sea

RV SONNE Sampling of a southern origin eddy west of Barbados



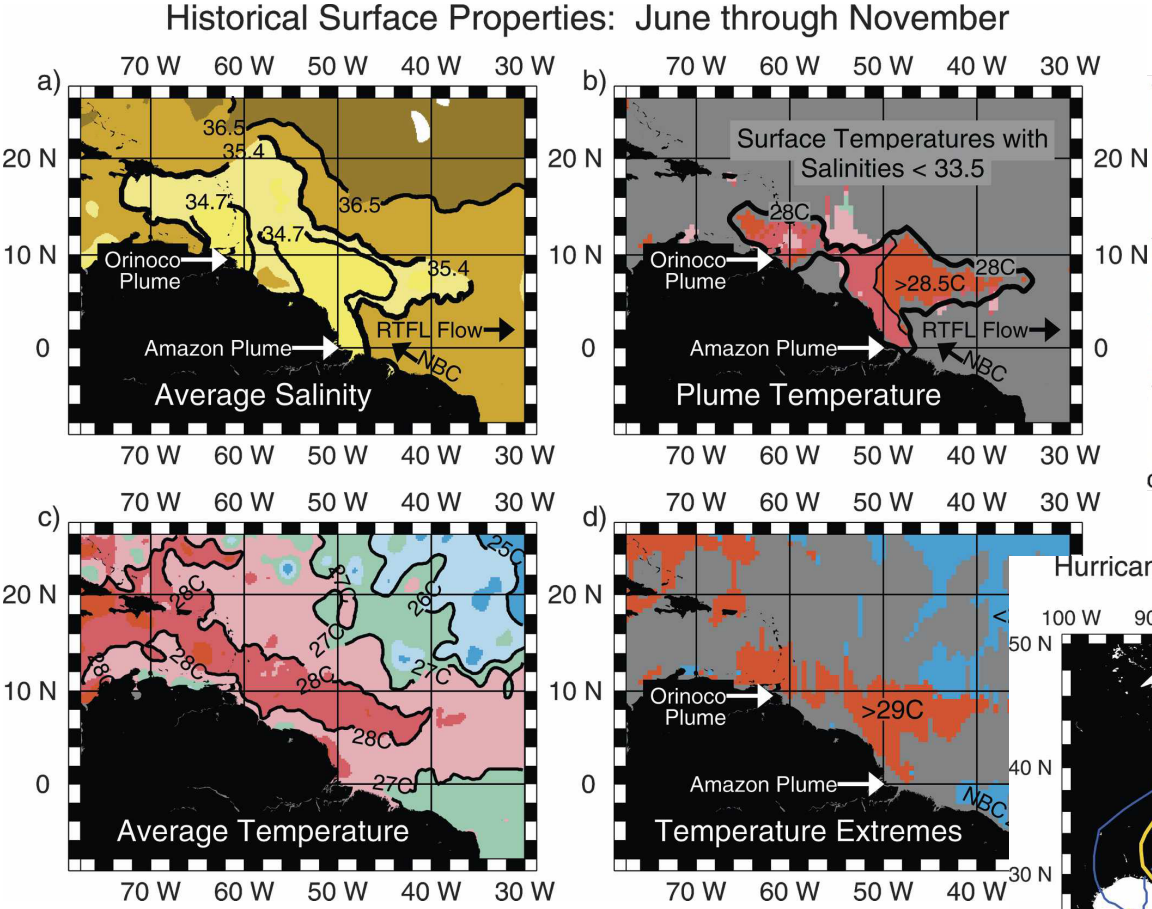


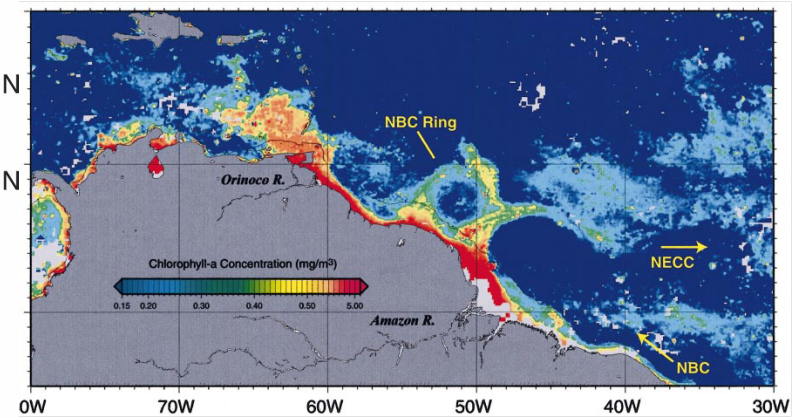


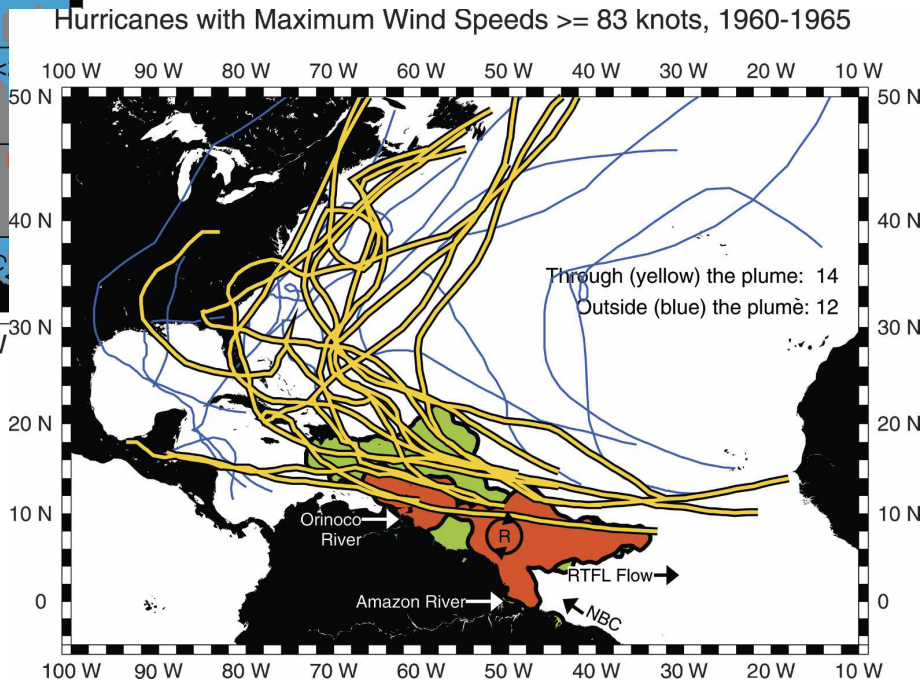
Laxenaire et al., 2018; Bony et al., 2018; Karstensen personal communication; Olivier et al., in preparation

Ocean near Barbados: influenced by strong SST and SSS gradients, WBC & Mesoscale eddies

Relation between SST/SSS & Hurricanes







Ffield 2006

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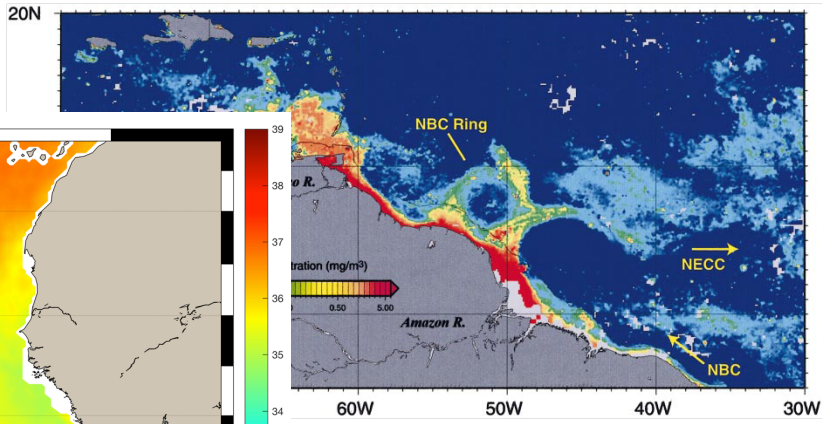

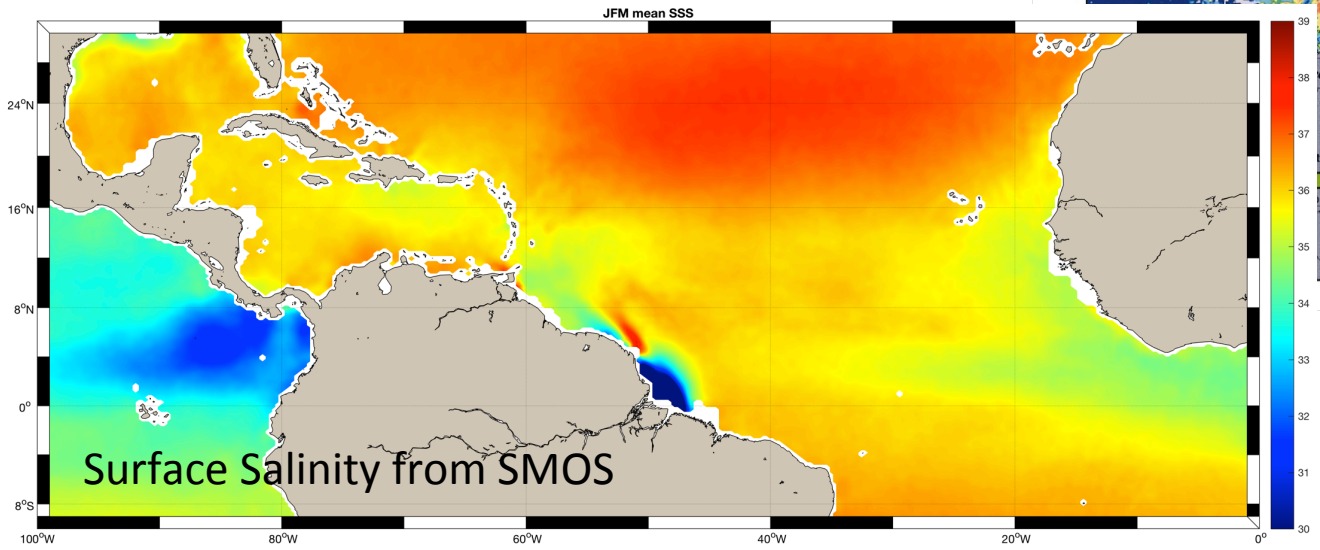

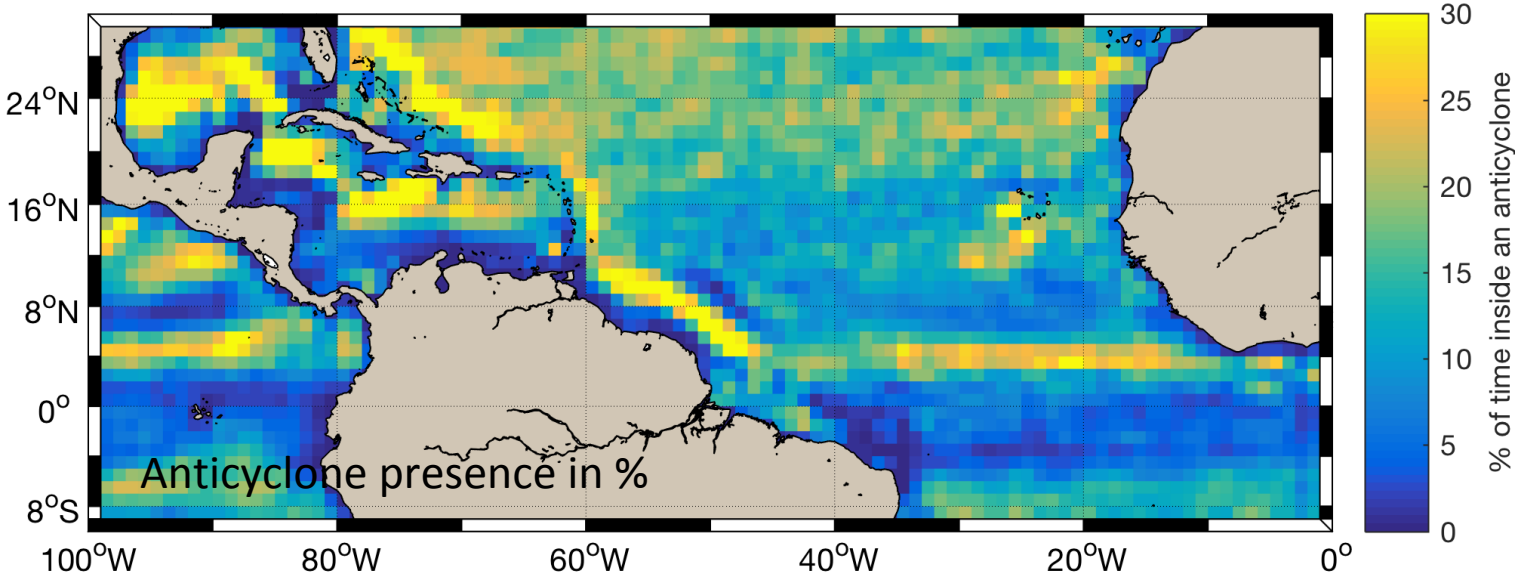

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- **EU-Additional:** L. Nuijens and Pier Siebesma (U. Delft), I. Sandu (ECMWF), S. Malinowski (U. Warsaw), M. Jochum (Niels Bohr)

The ocean is filled by eddies

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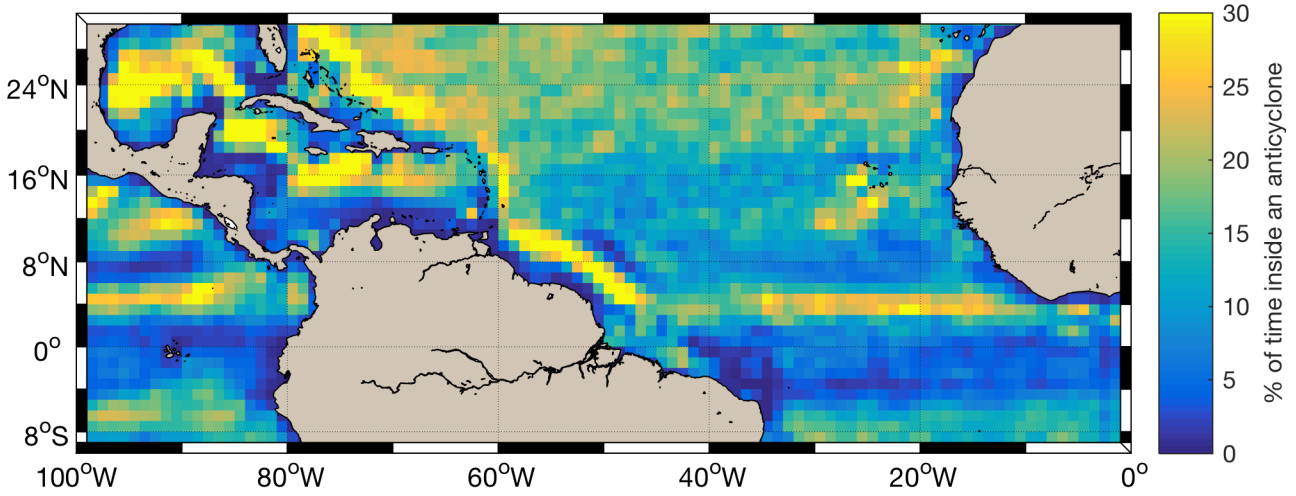

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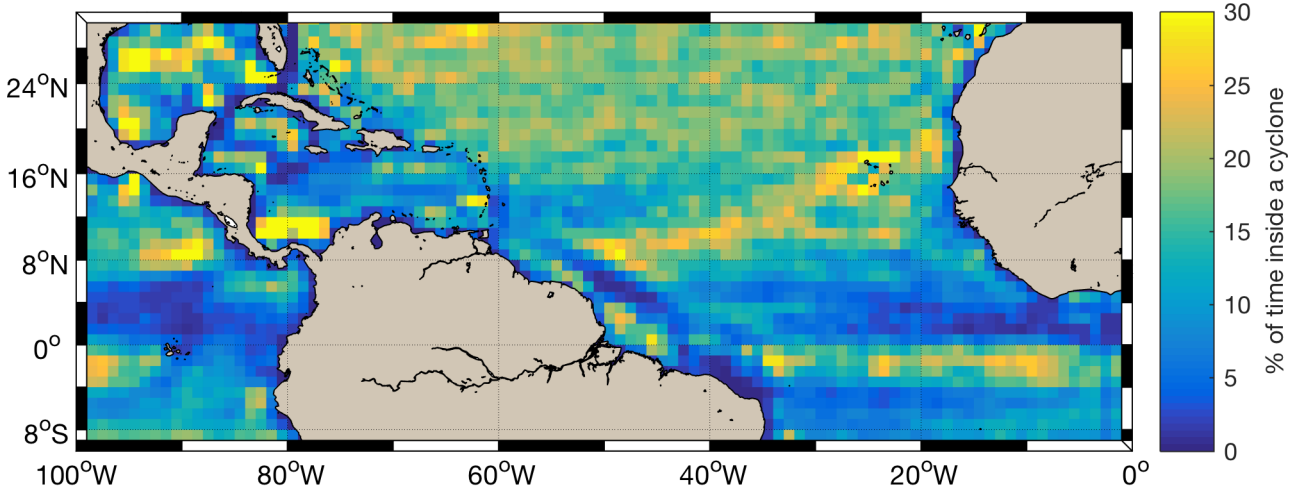

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