Abstract for SCOR-IOC meeting on Indian Ocean Science,
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Session 13 "Implementation of IIOE-
2: Presentation of National Plans“

Italian research in the Indian Ocean: present and planned activities

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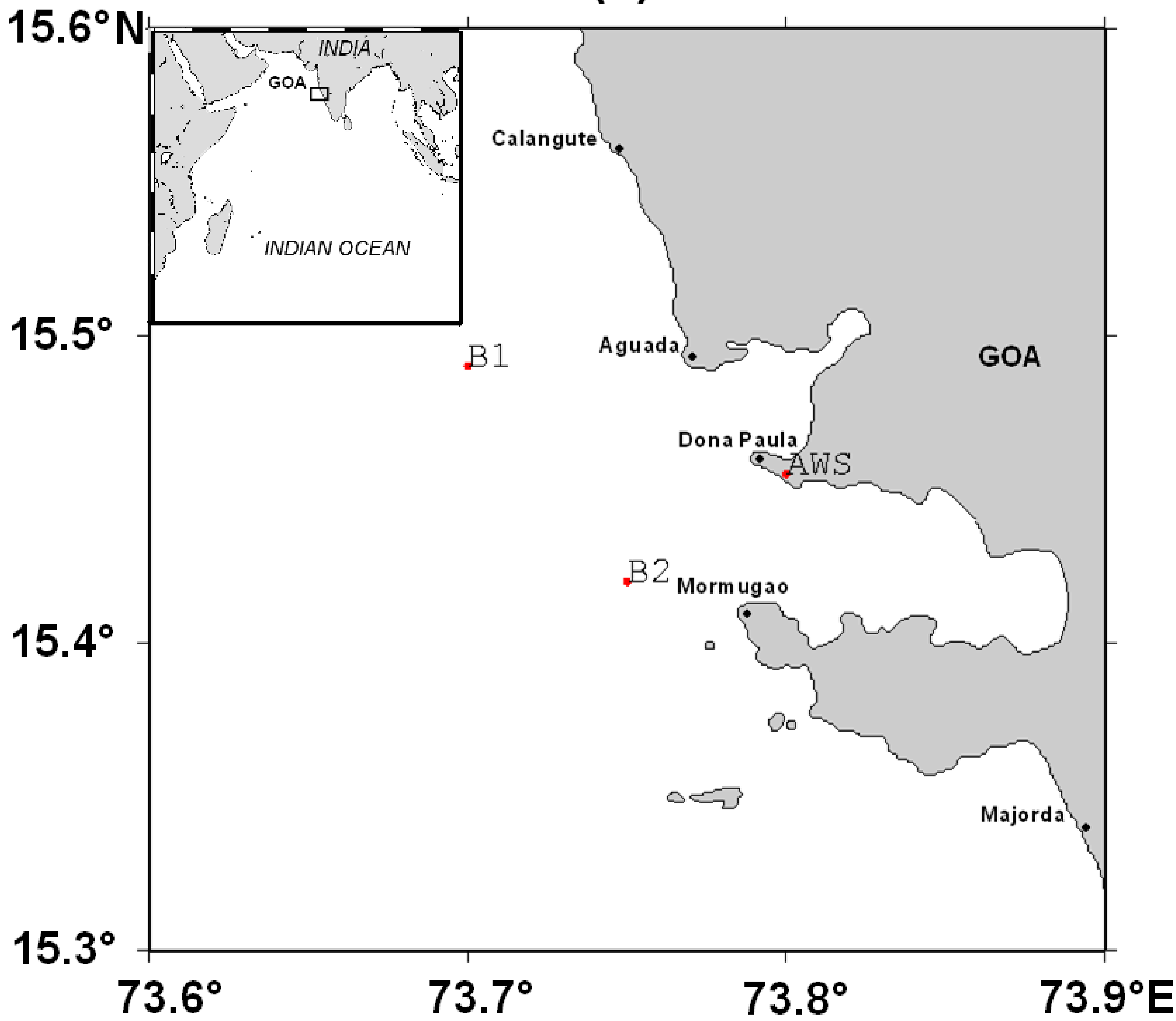

15.6°N
15.5°
15.4°
15.3°
73.6°
73.7°
73.8°
73.9°E
INDIA
GOA
INDIAN OCEAN
Calangute
Aguada
GOA
B1
Dona Paula
AWS
B2
Mormugao
Majorda

Wind sea (U10=14 m/s, Hs=1.4 m) at two minute distance, without and with heavy rain.

Picture taken on December 2014 from the ISMAR oceanographic tower.

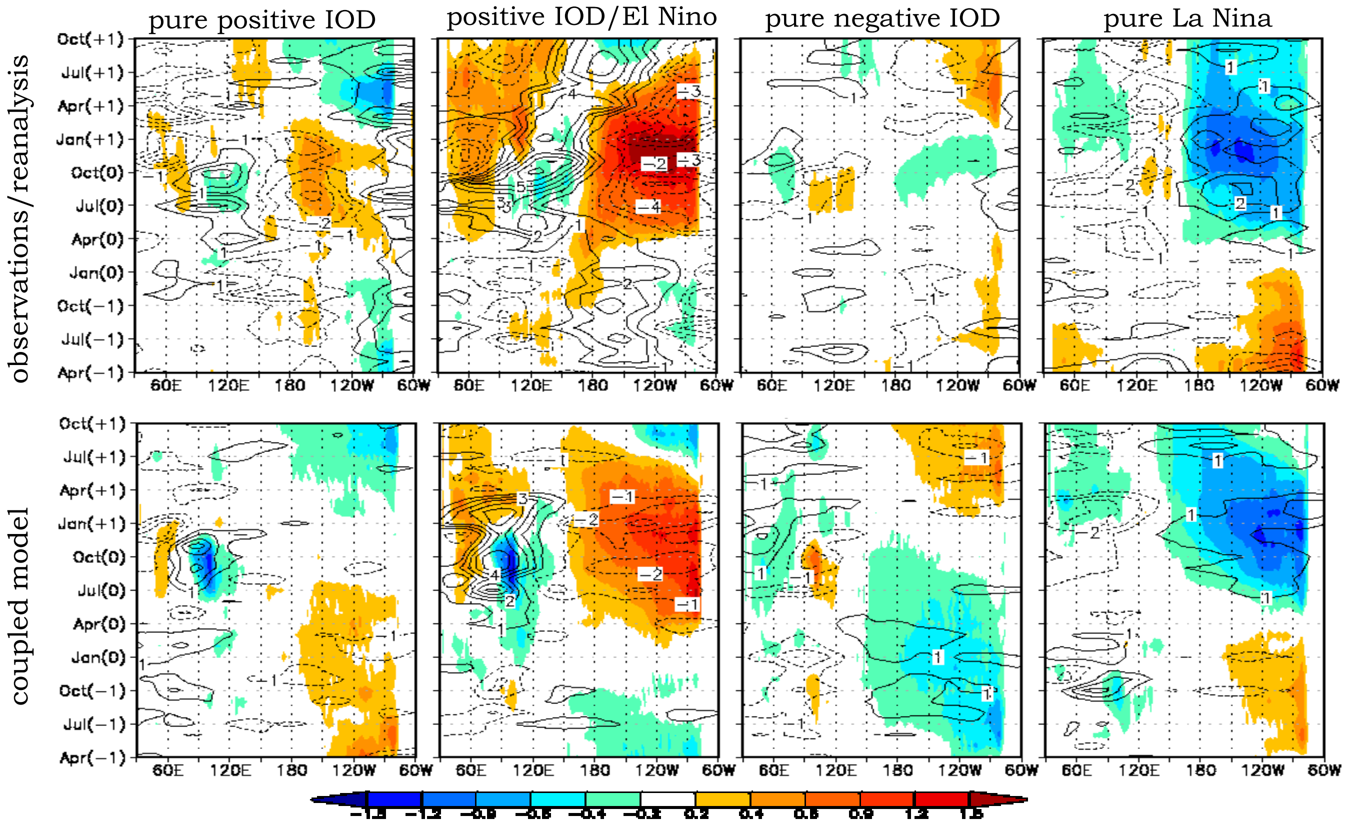
Note the quasi-absence of breakers under the rain (from Cavaleri et al., 2015).

ENSO & Indian Ocean Dipole events composites

Table: classification of ENSO and IOD events (pure and combined)

Type of event	List of years (HadISST)	# of years (SSXX)
pure pIOD	1961, 1963, 1967, 1987, 2002	8
pIOD/ElNino	1972, 1982, 1991, 1994, 1997	8
pure ElNino	1957, 1965	3
pure nIOD	1956, 1958, 1960, 1964, 1968 1974, 1992, 1996, 1998	9
nIOD/LaNina	1975	2
pure LaNina	1949, 1955, 1970, 1973, 1984, 1988, 1999	12

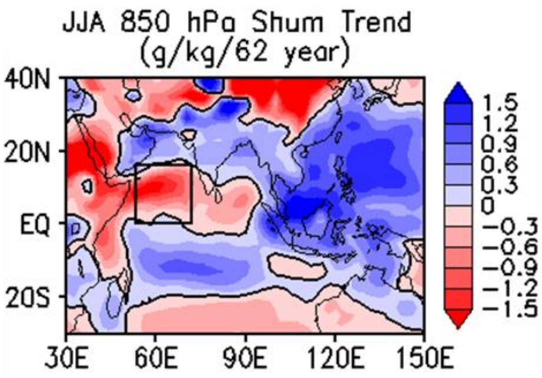
SST (° C, shaded) & 200 mb velocity potential (10^6 1/s^2, contours)



when IOD and El Nino co-occur (often in the last decades) SST and upper troposphere velocity potential are larger in the Indian-Pacific sector and they are more effective over the monsoon region

Cherchi and Navarra (2013)

Moisture flux budget (Arabian Sea)

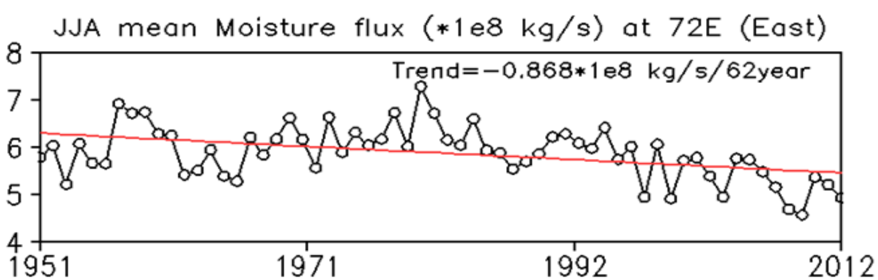


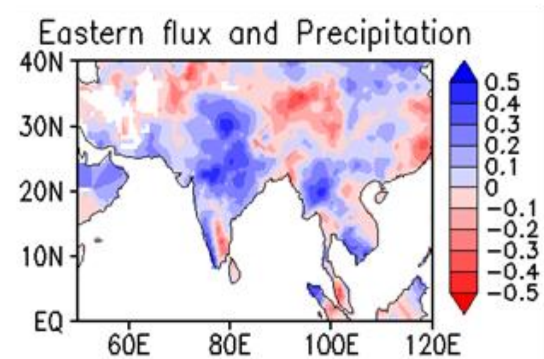
Fluxes across different sections of a box (see figure) over the Arabian Sea considering
Eastern boundary: 0 – 16N; Southern boundary: 53E – 72E;
Western boundary: 0 – 16N; Northern boundary: 53E – 72E

$$F_V = \frac{1}{g}\int_{p_B}^{p_t}\int_0^L q\,v_n\,dl\,dp$$

decreasing trend of low-level moisture over the East Africa/Arabian Sea region and increasing trend in Western Pacific

g = acceleration of gravity
p_b, p_t = pressure at surface and top of the layer
L = horizontal length of the section
q = specific humidity
v_n = wind normal to the horizontal section



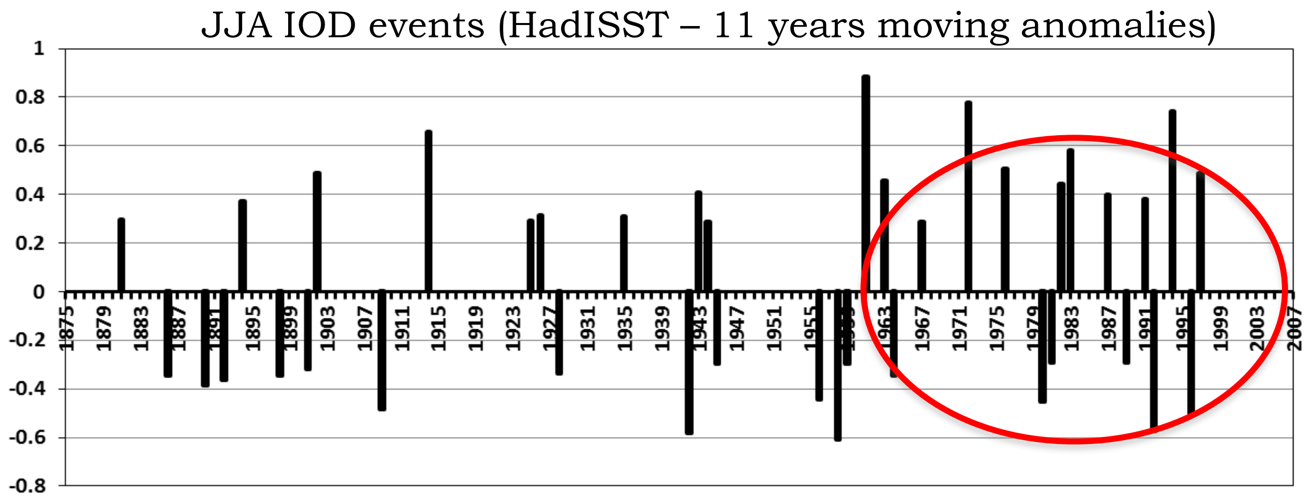


moisture transport along the eastern boundary is decreasing throughout the period (left panel);

it contributes to the decreasing precipitation over the west coast of India and central east India and Myanmar region. In fact it has a strong positive correlation with the precipitation over India (right panel)

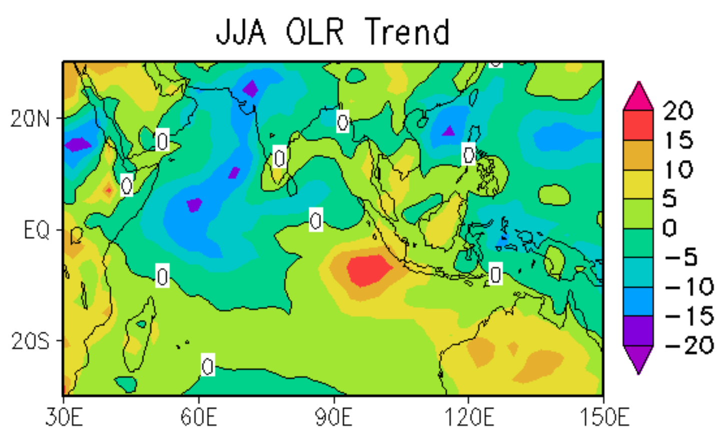
Ratna et al. (2015)

Indian Ocean Warming & Indian Ocean Dipole (preliminary results)



More pIOD events (& more intense) occurring after 1961 – projections of increased IOD frequency due to GHG (Cai et al., 2014)

Higher IOD variability during 1961-2007.



Convection is increasing over the western equatorial Indian ocean and decreasing over southeast equatorial Indian ocean – positive IOD conditions

- same analysis in SON – different behavior

- investigation of IO dynamics involved (within season, for strongest recent events) – long oceanic re-analysis (Masina et al., 2011) + comparison with recent high resolution oceanic re-analysis (Storto et al., 2013)