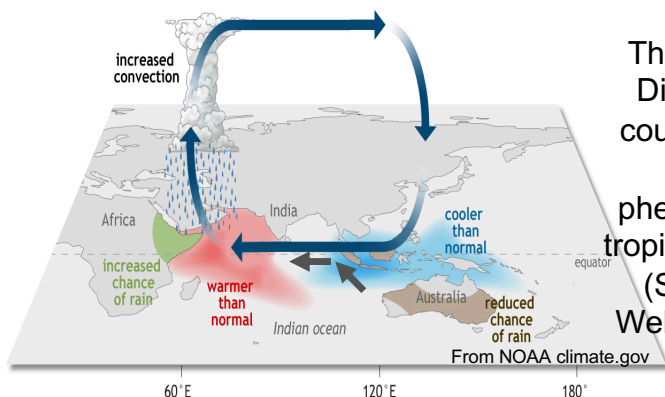


On the relationship between Indian Ocean dipole, Indian summer monsoon and ENSO

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The Indian Ocean Dipole (IOD) is a coupled ocean and atmosphere phenomenon in the tropical Indian Ocean (Saji et al 1999; Webster et al 1999)

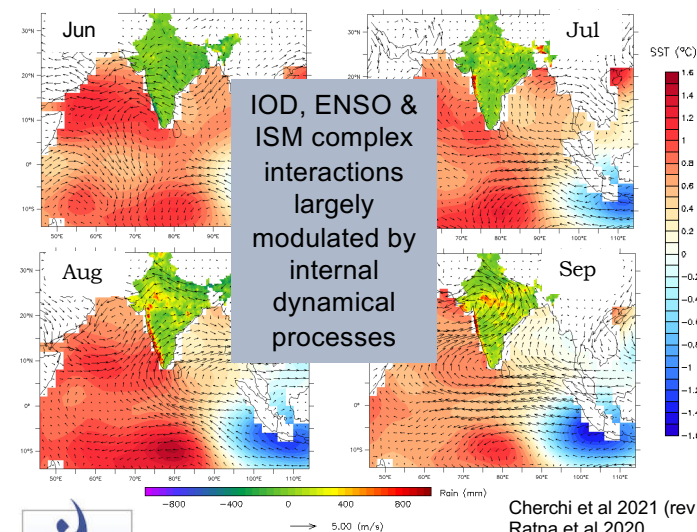
IOD & Indian summer monsoon (ISM): (i) direct influence via moisture transport or modification of local Hadley cell (i.e. Behera and Ratnam, 2018); (ii) IOD, ISM & ENSO embedded into the tropospheric biennial oscillation (TBO) framework (i.e. Webster and Hoyos 2010)

IOD & ENSO: (i) IOD forced by ENSO (i.e. Dommenget 2011; typical year 1997); (ii) IOD free mode of variability of tropical IO (i.e. Behera et al. 2006; typical year 1994); IOD as trigger of ENSO (i.e. Jourdain et al 2006, prediction framework)

The 2019 IOD case

IOD, ENSO & ISM complex interactions largely modulated by internal dynamical processes

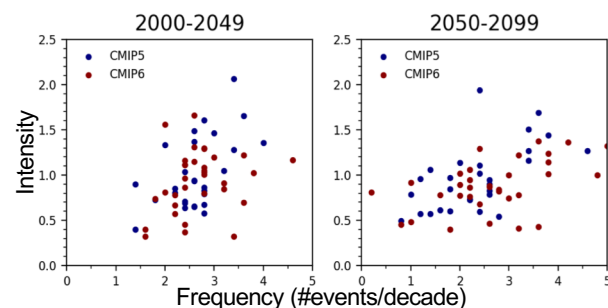
June: delayed onset, monsoon rainfall deficit, cyclone VAYU (Pacific effect dominated)
July: El Nino weakened, IOD started
Aug-Sep: monsoon rainfall excess (IOD effect dominated)



Cherchi et al 2021 (rev chapter);
Ratna et al 2020

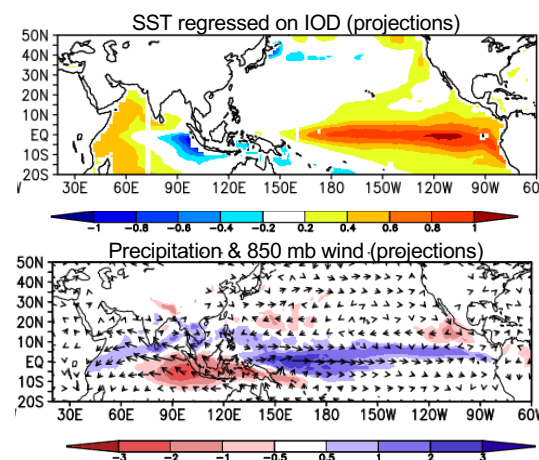
IOD in the future

Both CMIP5 and CMIP6 indicate increased SST variability of strong pIOD event and decreased SST variability for moderate pIOD events – more likelihood of 2019-like events (Cai et al 2021)



21st century: more intense and more frequent events (mostly for pIOD and CMIP6 models); SST larger IOD-related anomalies over Pacific and Indian Oceans; modest positive rainfall anomalies over India and weaker easterlies along the equator

Cherchi et al 2021 (in preparation); Cherchi et al 2021 (review chapter)



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What's next: non-linearities & models' stratification

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