

Monsoons/ISO Break-out

30-60 day Variability

- What are the outstanding challenges/errors?
 - Active-break transitions not forecast, and typically not represented in GCMs
- Have the root causes been identified?
 - Not specifically, surely missing physics and lack of basic understanding
- What are the broader implications of these errors?
 - Limit medium-range and seasonal predictability, and ENSO forecasting, simulation of extreme events and teleconnections compromised
- What approaches may be useful to reduce these errors?
 - Improved theoretical understanding of basic physics involved
 - Parameterization development (convective-physics package sensitivities)
 - Community-wide diagnostics are now available via US CLIVAR MJOWG
- Is there a need to design/coordinate focused experiments, and if so, how should this be done?
 - Predictability experiments(?); through US CLIVAR MJOWG, International CLIVAR panels
- Does the lack of observational data inhibit progress in this area, and if so, what observations are needed (process studies and/or long-term monitoring)?
 - Need to exploit VASCO/CIRENE campaign data and improve coverage over data sparse regions (e.g., Indian Ocean), and new satellite data (e.g., CloudSat, A-train) to better understand physics involved, more in-deph diagnosis with reanalysis
- Other subseasonal modes need to be investigated (e.g., 10-20 day mode)

Monsoon

- What are the outstanding challenges/errors?
 - Mean state errors; too little precipitation, regional fidelity important
 - Better understanding of moisture transports involved, low-level jets, land surface interactions (soil moisture, snow, ...), extratropical and remote influences including atmosphere (stationary waves) and ocean (Atlantic), role of aerosol/dust
- Have the root causes been identified?
 - No
- What are the broader implications of these errors?
 - Societal and agricultural impacts, compromised teleconnections
- What approaches may be useful to reduce these errors?
 - Improved theoretical understanding of basic physics involved
 - Better understanding of multi-scale interactions, role of the ocean
- Is there a need to design/coordinate focused experiments, and if so, how should this be done?
 - Predictability experiments(?); Through US CLIVAR MJOWG, International CLIVAR panels
 - Need to save more comprehensive ocean-atmosphere fields from experiments
- Does the lack of observational data inhibit progress in this area, and if so, what observations are needed (process studies and/or long-term monitoring)?
 - Need to exploit VASCO/CIRENE campaign data and improve coverage over data sparse regions (e.g., Indian Ocean), and new satellite data (e.g., CloudSat, A-train) to better understand physics involved
 - Follow-up intercomparison of reanalyses to ascertain if errors reduced over data sparse regions

Metrics/Diagnostics

- Comprehensive suite of MJO metrics now available
- Need to develop metrics to address broader monsoon issues (e.g., mean state, interannual, interdecadal variability)
 - For Asian-Australian monsoon system a preliminary suite of metrics have been developed CLIVAR AAMP input will be valuable
- Need to “inspire” other CLIVAR panels to develop metrics