How to evaluate the simulated ISV?

• Average pattern not sufficient:
  • What is the meaning of the average perturbation pattern?
  • Are there (at least) some realistic ISV events simulated?
  • Inspect the ENSEMBLE of ISV events:
    • What is the reproducibility of the simulated perturbation patterns among the different ISV events?
    • What is the realism of the simulated perturbation patterns for the different ISV events.

The distance between two patterns

Approach

The Local Mode Analysis

• Based on windowed Complex EOF analyses.
• The LMA detects each ISV event and gives its perturbation pattern with a simple mathematical form.
• An average pattern may be computed and compared to the pattern of each event:
  • Assess the reproducibility of the perturbation pattern.
  • Assess the realism of the simulated ISV by comparing each pattern to the average OBSERVED pattern.

Climate simulations

- GCP observations
  - 1970-2006
  - 30 30-day events
- RCP 8.5 simulates 21st century climate
  - 40 events
- 1385 events/model

Hindcasts

• We use part of the seasonal hindcasts performed in the framework of the ENSEMBLES project:
  • multi-model
    • IFS/HOPE, ARPEGE/DAPA, HadGEM2, ECHAM/DAM
• Different initialization procedures:
  • Initial conditions from ocean analyses forced by ERA-40 surface fluxes with different perturbations in surface stress and SST (IFS, ARPEGE, HadGEM2). Initial conditions from three member ensemble coupled simulation where the model SST is restored to observed SST values (ECHAM)

Conclusions

- Development of an event-by-event diagnostic of the ISV
  • Good Reproducibility of the Monsoon ISV pattern in observations
  • Weak Reproducibility for most coupled GCMs
  • Large range of skills among the different coupled models
  • For models with a poor Realism in the ISV patterns:
    • Poor Reproducibility of the ISV pattern
    • Too local ISV of the precipitation
    • Not governed by large-scale organized events
    • More reality of the time power spectrum
    • Weak day to day variability

Precipitation spectra - BoB

- Seasonal hindcasts

- The better Reproducibility and Realism of the ISV patterns in May-June for IFS is related to the triggering of ISV events generated by a response of the convective scheme to the initialized SST field.
- These "forced" ISV events are quite realistic (Gill response to organized rain perturbations) but may hide or perturb a real ISV event for a particular year.

Effect of the SST initialization

- WARM SST anomaly in the western equatorial IO
  • Increased ISV activity at the period of the tropical ISV
  • The SST anomaly is maintained 24 hours, whatever the convective scheme

- MORE SST anomaly in the western equatorial IO
  • Reduced ISV activity at the period of the tropical ISV
  • The SST anomaly is maintained 24 hours, whatever the convective scheme