WCRP hybrid symposium on Frontiers in Subseasonal to Decadal Prediction
2023.3.28, ECMWF Reading, UK

Current and future directions for development of subseasonal to multi-seasonal climate services

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APCC APEC CLIMATE CENTER

Climate Services

Anticipated Change → Assessing impact → Action

Seasonal prediction

Prediction of weather statistics for a couple of seasons


letters to nature

Forecasting Andean rainfall and crop yield from the influence of El Niño on Pleiades visibility

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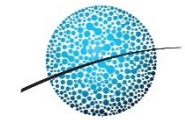
Food and Agriculture Organization of the United Nations


CLIMATE-SMART AGRICULTURE

Using seasonal forecasts to support farmer adaptation to climate risks



Climate information for decision making

- Properties for Usable information (Cash et al. 2003, Kirchhoff et al. 2013)
  - Credibility : Quality of information, Provider's reputation
    - Forecast accuracy
  - Salience : fitness to context of user
    - Scale, Variables, Products
  - Legitimacy : cleanness of information from other factors
    - Objectivenss, Openness
- Co-production by "producers" and "users"

APEC Climate Center

- Established in 2005 by indorsement of 21 APEC economies

  Aims “enhancement economic opportunities, reduction of economic loss and protection of life and properties through: exchange of data, producing skillful prediction, targeted research and capacity building… ”

  APCC working groups -

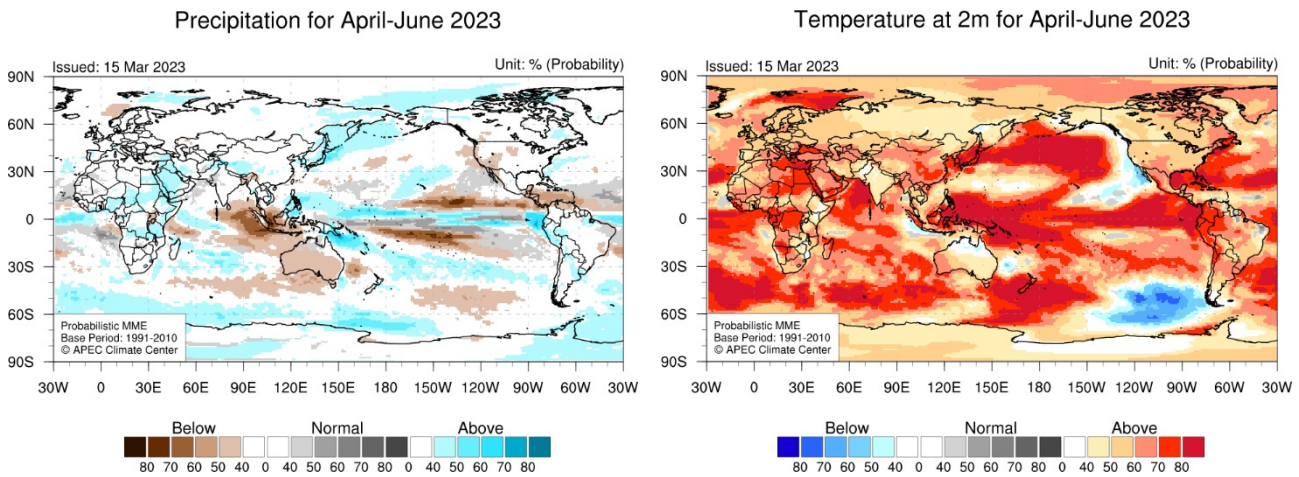
  Representatives of NHMSs of member economies

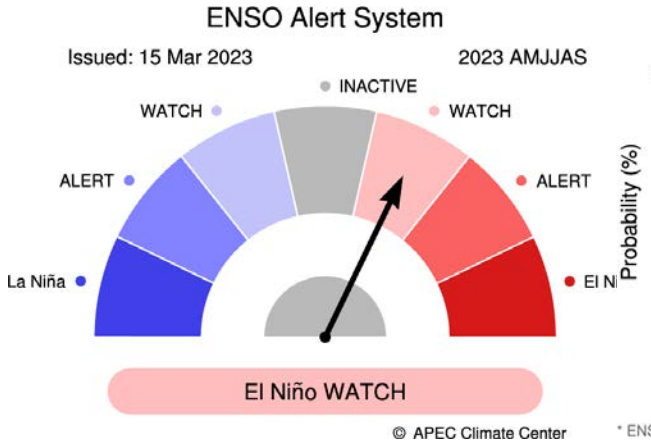
  : 1st customer of APCC products

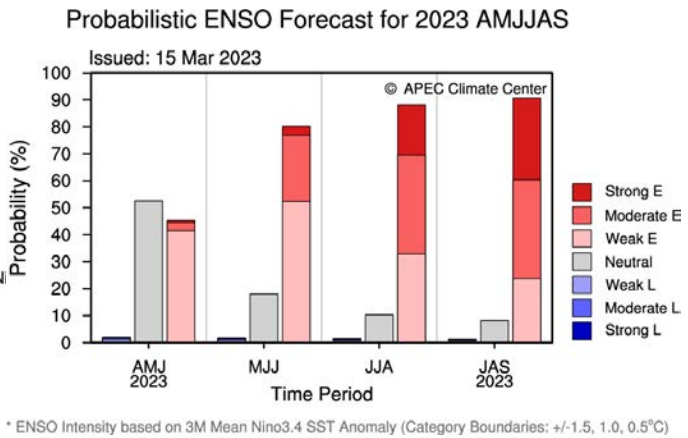
Multi Model Ensemble participating groups

Multi Model Ensemble Seasonal forecast

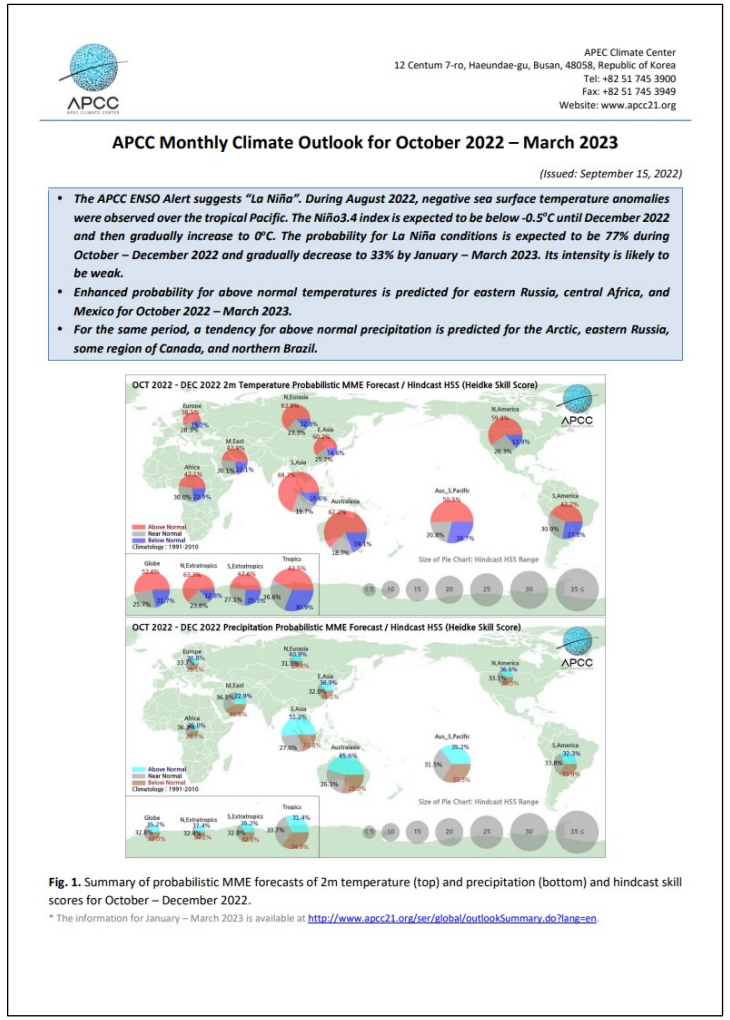
6 month lead climate outlook







* ENSO Intensity based on 3M Mean Nino3.4 SST Anomaly (Category Boundaries: +/-1.5, 1.0, 0.5°C)



APCC

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APCC Monthly Climate Outlook for October 2022 – March 2023

(Issued: September 15, 2022)

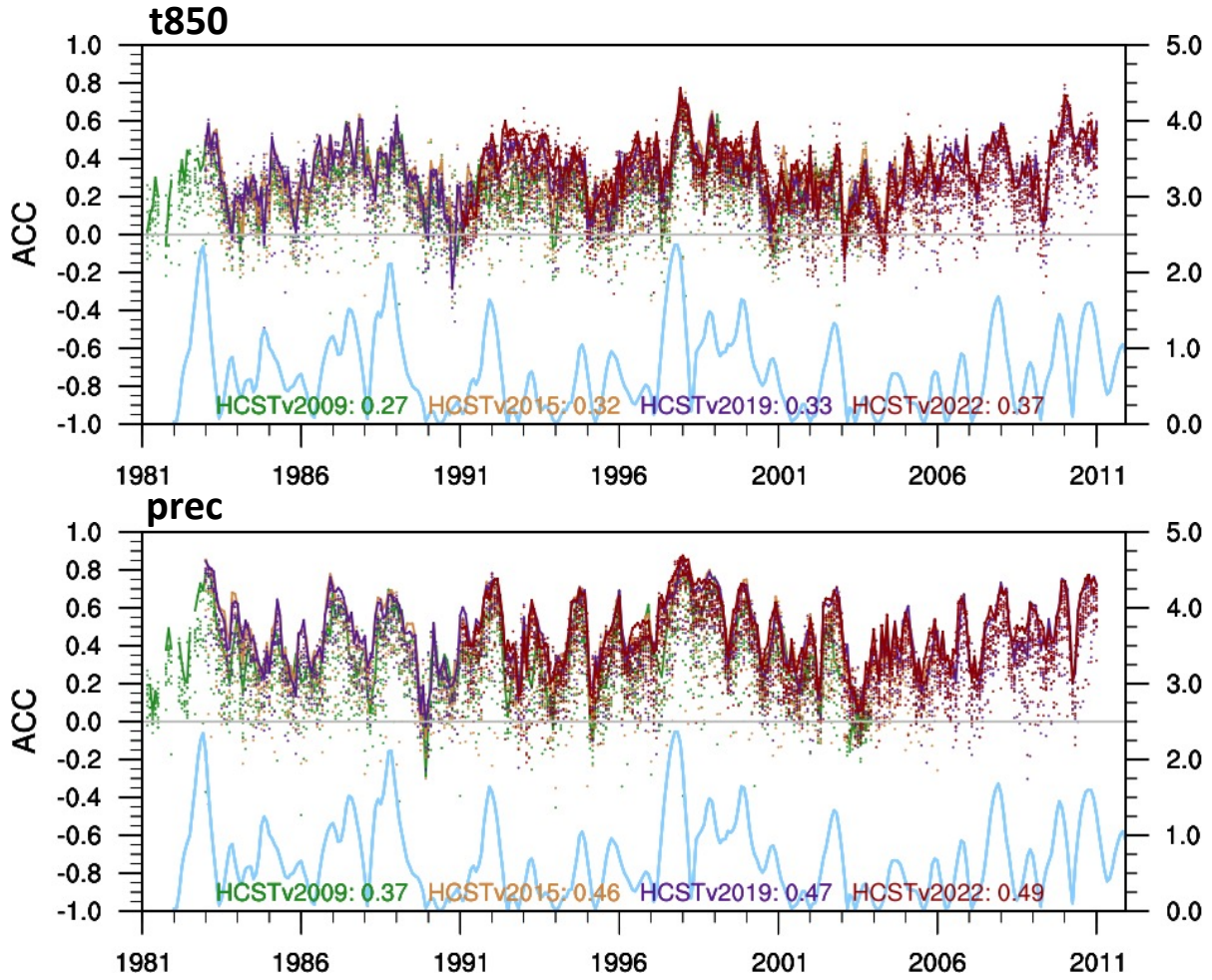
- ***The APCC ENSO Alert suggests "La Niña". During August 2022, negative sea surface temperature anomalies were observed over the tropical Pacific. The Niño3.4 index is expected to be below -0.5°C until December 2022 and then gradually increase to 0°C. The probability for La Niña conditions is expected to be 77% during October – December 2022 and gradually decrease to 33% by January – March 2023. Its intensity is likely to be weak.***
- ***Enhanced probability for above normal temperatures is predicted for eastern Russia, central Africa, and Mexico for October 2022 – March 2023.***
- ***For the same period, a tendency for above normal precipitation is predicted for the Arctic, eastern Russia, some region of Canada, and northern Brazil.***

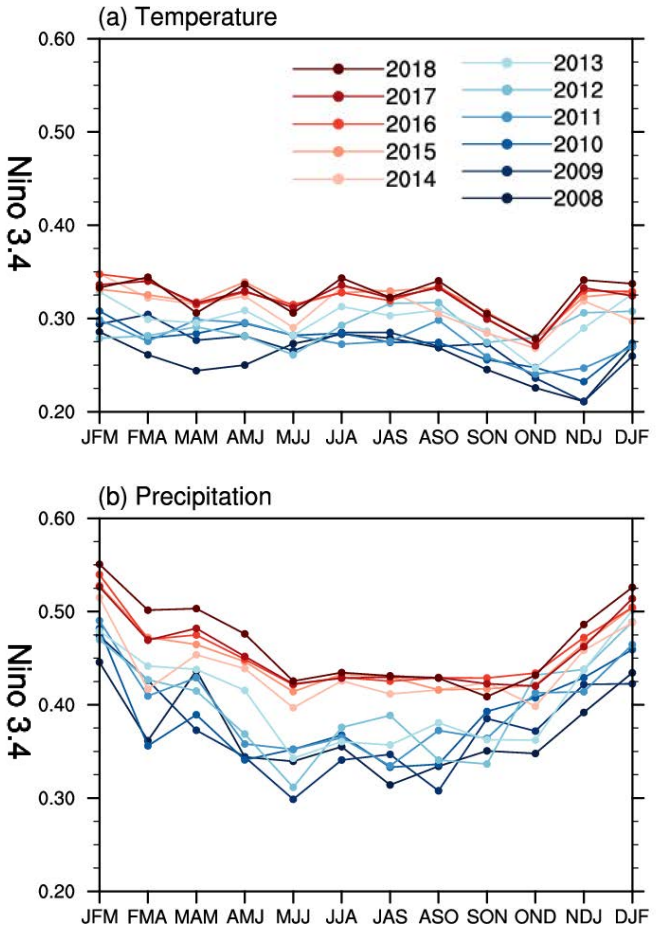
Fig. 1. Summary of probabilistic MME forecasts of 2m temperature (top) and precipitation (bottom) and hindcast skill scores for October – December 2022.

* The information for January – March 2023 is available at http://www.apcc21.org/ser/global/outlookSummary.do?lang=en

Is our seasonal prediction improving? (credibility)

Global ACC of seasonal mean forecast from MME and individual models : Hindcast





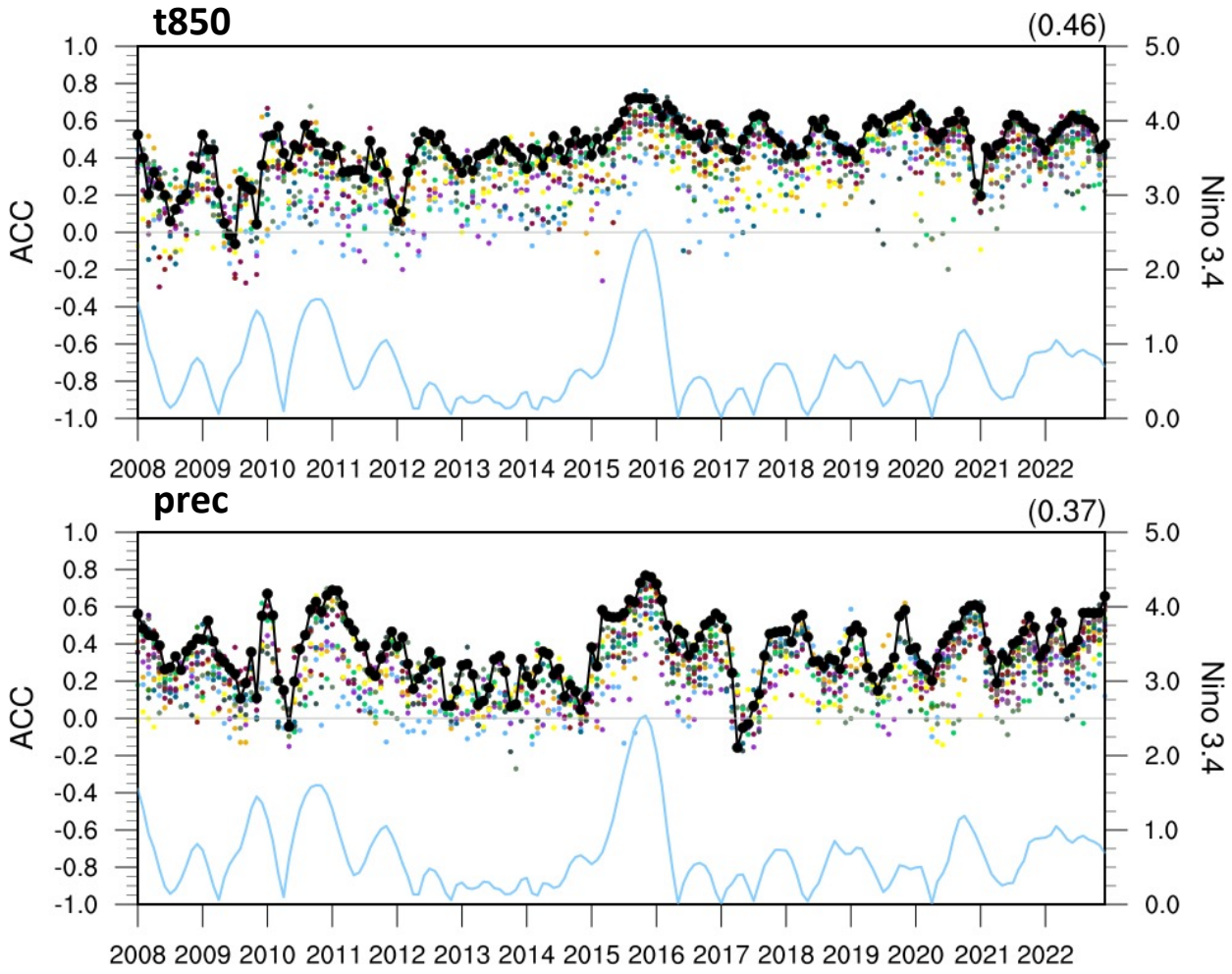
Hindcast skill has been improved a lot

Collective improvement of prediction models

(participating group has been changed, better models, more models..)

Is our seasonal prediction improving?

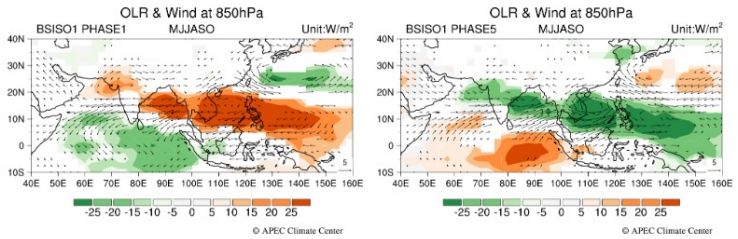
Global ACC of seasonal mean forecast from MME and individual models : Forecast



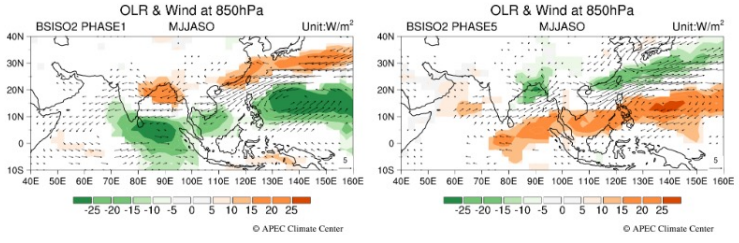
For the forecast,
Improvement is not (yet?) apparent especially for the precipitation

BSISO (Boreal Summer Intraseasonal Oscillation)

BSISO1



BSISO2



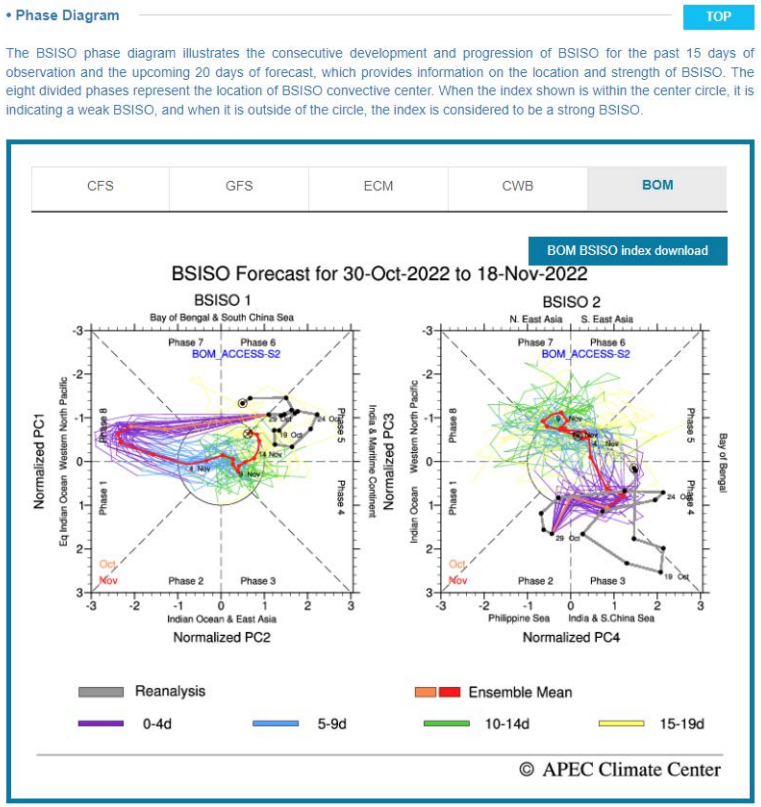
2 northward propagating modes associated with Asian Monsoon Variability

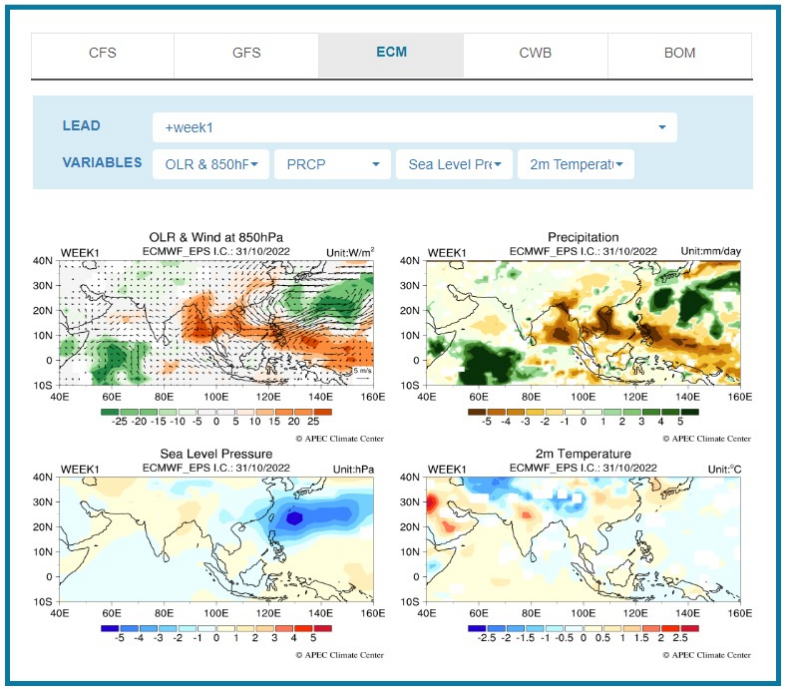
BSISO1 : summer MJO
BSISO2 : shorter time scale

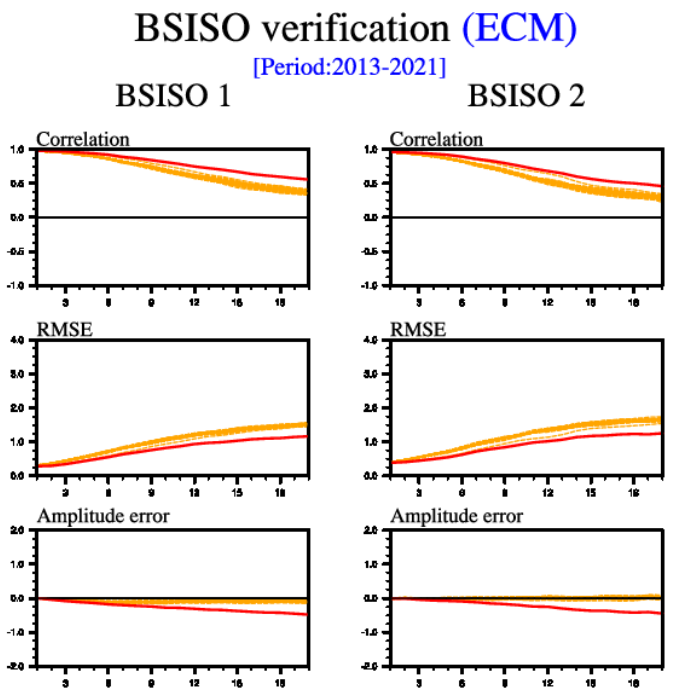
Provides predictability source over south and southeast Asian countries in subseasonal time scale

BSISO forecast (May to Oct.)

4 centers (NCEP, ECMWF, CWB, BoM)







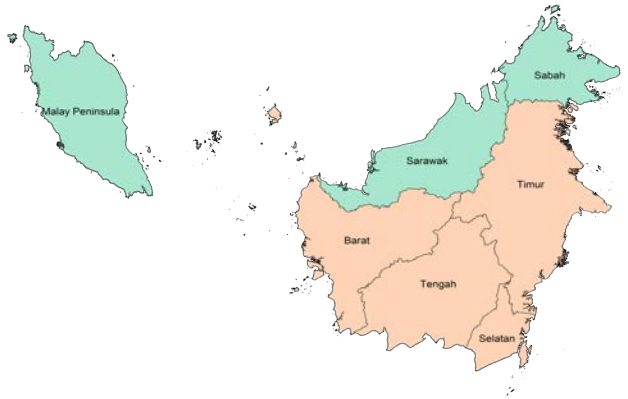
Tailoring climate information

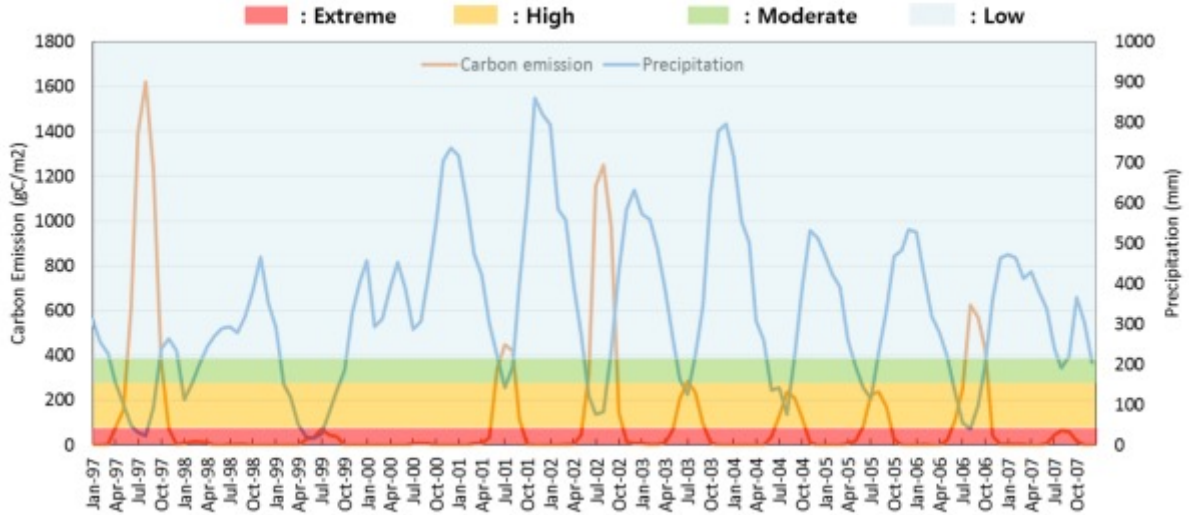
- Transforming information to enhance salience (and credibility)

- Scale : Climate info. >> user interest
  - Statistical downscaling
- Form (output) : lack of knowhow to use the info.
  - Impact modeling
  - analysis of model output

Applied products

Fire early warning (SEA)

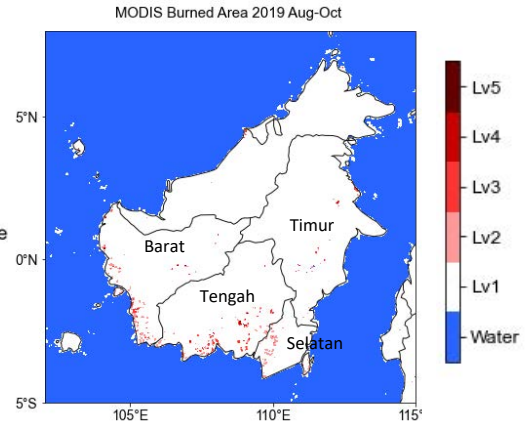




Monthly History of Probabilistic Forest Fire Forecast for 2019

	Issued APR	Issued MAY	Issued JUN	Issued JUL
Barat	100%	91%	93%	93%
Tengah	67%	77%	85%	85%
Selatan	57%	96%	98%	98%
Timur	100%	100%	85%	85%

Extreme
High
Moderate
Low



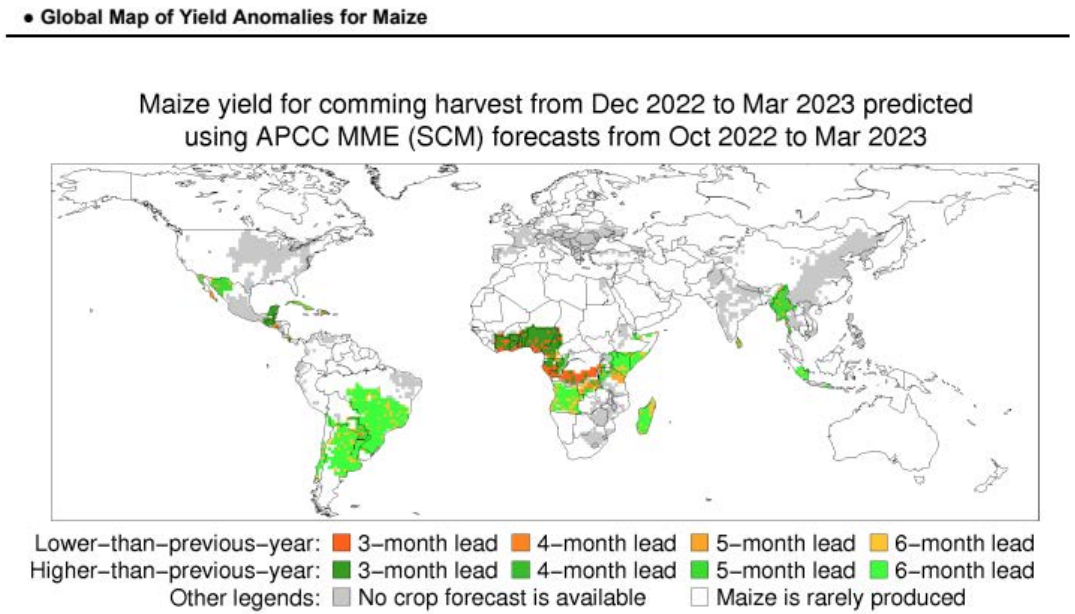
- Global Fire Emission Database (GFED)
- Bias corrected Rainfall forecast

Initially(2016) targeted only for Indonesia (Borneo island), Met. Malaysia requested expansion of service area (2022)

Applied products

Crop yield prediction

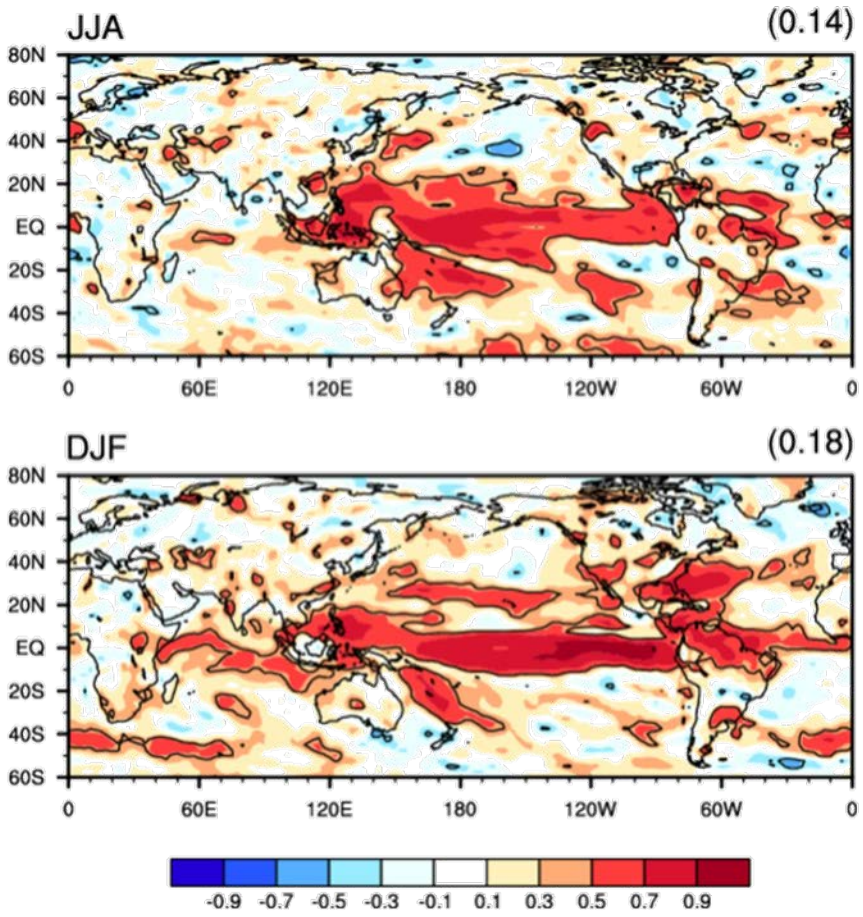
Experimental, limited access

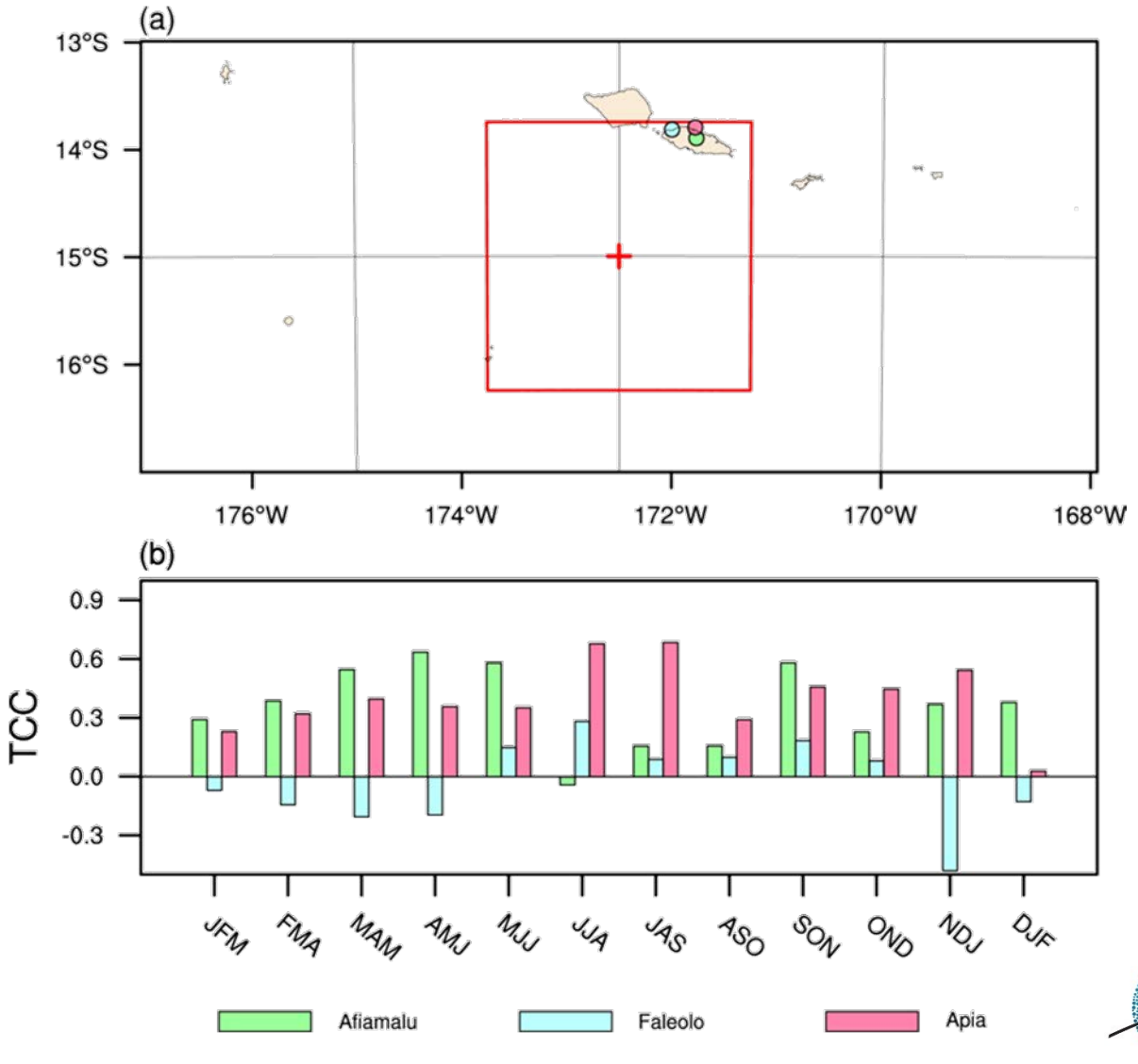


Collaboration between APCC and NARO (Japan)

- Predicting relative crop yield change compared with previous year
- Statistical yearly (growing season) crop yield forecast model
- Less skillful than JRC, USDA but longer lead-time
- Testing operation since 2019

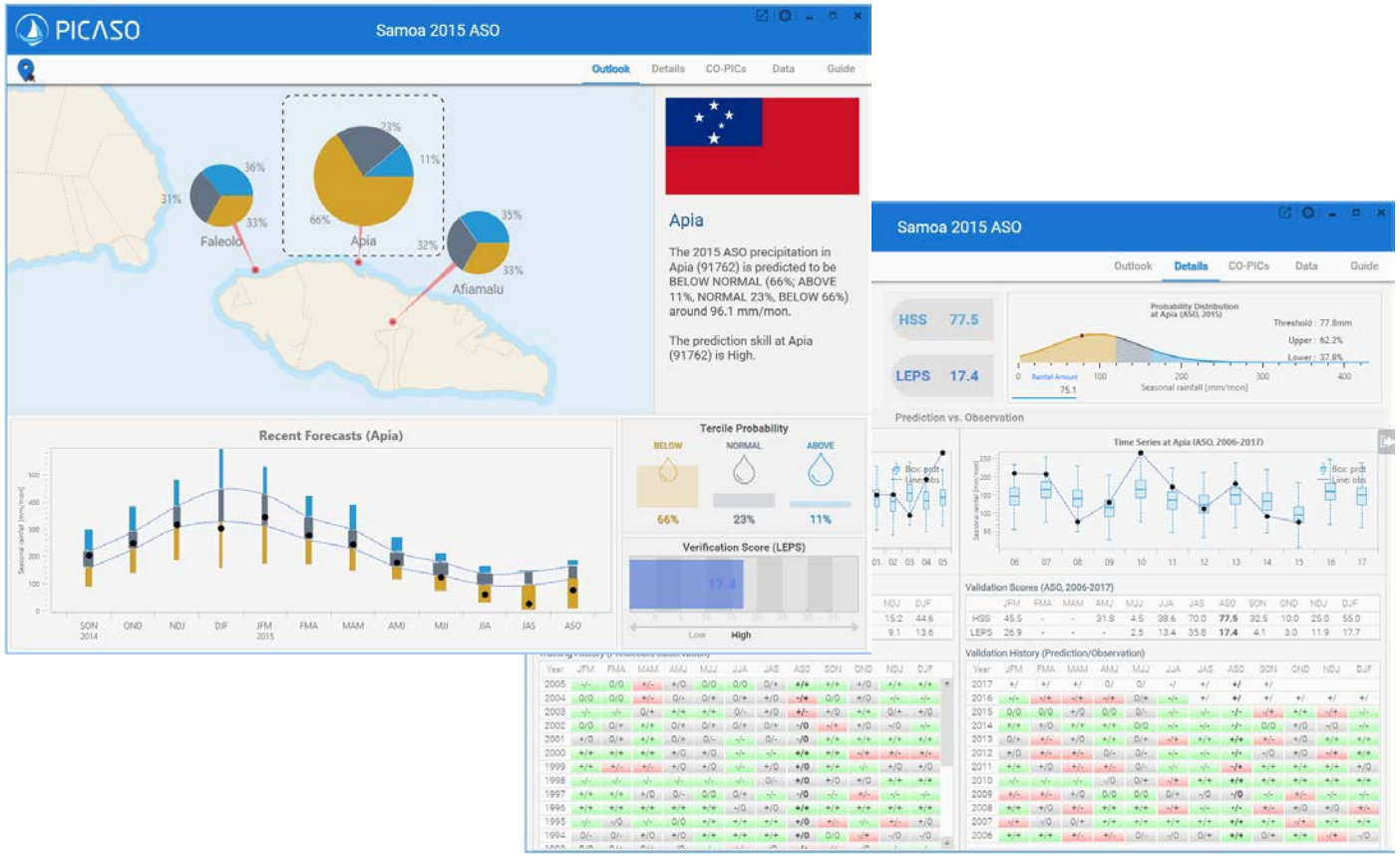
Pacific Islands Countries

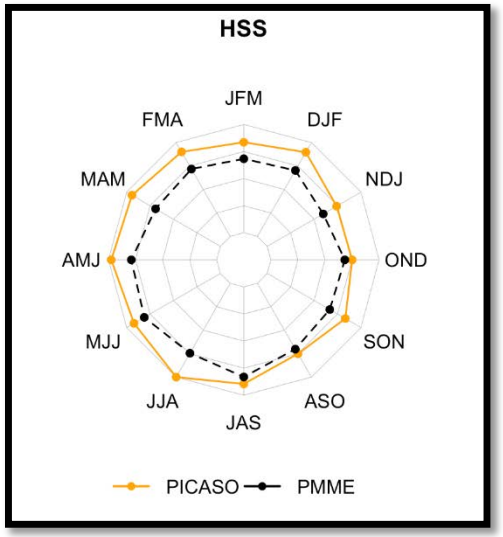




PICASO (Pacific Island Countries Advanced Seasonal Outlook)

- Statistical Downscaling and Bias-correction





- Covering 14 PICs
- Easy to use
- Minimum resource requirement (network access)

Agricultural Decision Support (@ Vanuatu)

tailOred System of Climate services for AgRiculture (OSCAR)

- Weather and Seasonal forecast, Agromet indices (observation and forecast)
- Agricultural decision support (Crop modeling and Traditional Knowledge based)
- Crop data collection and DB update
- Information for public

- Champion farmers (demonstration)
- Govn't : Met. Svc, Agr. Svc.

Production and Sales

- manufacturer uses weather and seasonal forecast for estimating demands : Planning of production and mobilization

- Challenges (personal communication),
  - Communication : Hate Probability, Above/below “Normal”
  - Perception : what you told is not what I felt, scales, climate change, difference between obs. Station and street
  - Accessibility : needs forecast between weather and seasonal timescale (!)
  - Effectiveness : Weather/Climate Factor is not (less) important (weather/climate proofing tech.) : climate smart agriculture? Climate proof agriculture..

Numerous efforts are being made…

Which service will be kept in operation in the future?

R2O is important not only for production but also services

Climate Change Service

Climate Services Partnership

S2S4E
Climate Services for Clean Energy

For future climate services

- Basis : credible information and data (forecast)
  - progressing but in real-time forecast?
- Appropriate forms and means of communications
  - Researches are getting active, sharing best (worst?) practices
  - Seamless services (Multi-seasonal – Subseasonal – Weather)
- Sustaining mechanism
  - Requires robust platform (e.g. C3S, APCC) of provision and user engagement
  - Multiple Players and multiple roles (NFCS?)
    - Global (regional) centers
    - **NHMS**
    - Sector users
    - Private sectors
  - Governance

NHMS is the key player

- Operational mandate of service provision
- Climate services is usually country, local specific
- Coordination with weather/climate information to the public
  - Multiple information can generate tension between NHMSs and outer information
  - Staffs (mostly developing countries) were not well trained and they are often reluctant to provide new (unknown) things
- Empowering NHMSs for climate services is key to sustaining the services

Thank you

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