ACCESS-S2: An upgraded seasonal prediction system, including new operational forecast products

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ACCESS-S1

- UKMO GC2 model
- UKMO initial conditions (NEMOVAR) + BoM ensemble generation
- 23-year hindcast period (1990-2012)
- Real-time products based on time-lagged 99-member ensemble
- Went operational mid 2018
• In-house data assimilation (production of initial states)
• More timely forecasts
• Reduced reliance on UK Met Office for initial ocean states
• Same model, but some enhancements and corrections
• Longer hindcast set (1981-2018)
• Enhanced post-processing
ACCESS-S2 weakly coupled DA

Based on BoM/CSIRO Coupled EnKF software (Yonghong Yin, Pavel Sakov)

- Weakly coupled daily cycle
- Direct replacement of atmos basic variables
- Ensemble OI in ocean
- Ocean assimilation uses the background state from the coupled model
- Land surface and sea ice indirect through coupling
- Stronger nudging of SST than UKMO
- No altimeter assimilation (only T/S profiles)
- Multi-variate – ocean current increments
- 1981-present re-analyses
- Same perturbation scheme as in ACCESS-S1 for ensemble generation (only the atmosphere is perturbed)
Data assimilation

Example: ocean currents are better in ACCESS-S2

U (0N, 165E) Monthly mean U from ADCP TAO/TRITON, ACCESS-S2, S1 (1990-2013)

From: Yonghong Yin
Improved skill over Australia

Maximum temperature: benefits of realistic soil moisture initialisation

ACCESS-S1

ACCESS-S2

Difference (S2 minus S1)

Red = S2 is better

Correlation skill for May (from 1st May Starts)

From: Li Shi
Improved ocean skill

Some indications of improved forecasts of ENSO, particularly for forecasts started in Autumn

Correlation skill
Redder is better

"Strength" of ENSO
White is good

Ratio of model stddev/obs stddev

From: Eun-Pa Lim
New products from agriculture "Forewarned is Forearmed" project

December 2021 – February 2022
Chance of unusually wet

- Increased chance of unusually high rainfall (in top 20% of climatological period) in parts of eastern Australia.

Skill metric is ROC area

Managing and forecasting "extreme" climate events on multi-week and seasonal timescales

Research partners
BoM
Univ. Melbourne
Monash Univ.
Univ. S. Queensland
SARDI
DEDJTR
DAFQ
Birchip Cropping Group

Rural RDC partners
Meat and Livestock Australia
Grains RDC
Sugar Research Australia
Cotton RDC
AgriFutures Australia
Dairy Australia
Wine Australia
Australian Pork
An end-to-end and well-connected approach

Underpinning Science

User needs

Interfacing to industry decisions

Forecast development and delivery

Extension and training
Developing and delivering new forecasts

- Develop a range of heat, cold and rainfall multi-week & seasonal experimental forecast products from ACCESS-S
- Make experimental products available on a research web server for trial and feedback

- Feedback from reference groups of users in the dairy, beef, sheep, grains, sugar and wine industries.
- Deliver five operational products in a staged approach
What's next for the products?

- Product #3 goes live end March 2022. User feedback for proposed operational version underway

- Operational design of products #4, #5 being initiated, going live end May 2022

#3 – Location based weekly/monthly time series of rainfall/temperature outlooks (Climagrams)

#4 Location based rainfall probability of exceedance chart

#5 Maps showing heightened probability of rainfall burst (3-day accumulations)
What's next for modelling?

Seamless global coupled modelling

- Seamless and consistent forecasts across timescales and domains (days to seasons; atmosphere and ocean)
- Development (jointly with UKMO) of seamless coupled earth system modelling framework
- Ocean-atmosphere interactions are also important on shorter timescales, for both weather and ocean prediction
- UKMO: operational coupled global NWP forecasts Feb 2022
- BOM starting to investigate coupled NWP and extension into the sub-seasonal

Future global weather, ocean and seasonal forecast model
Thank you

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Research Program

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