Towards the effective communication of weather and climate information—harnessing new technologies to integrate material from various sources on the web to generate new products

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In the context of the American Meteorology Society's (AMS) meeting Communicating Weather and Climate, the AMS observes that effective communication is essential for scientific research, education and serving the public. It proposes effective integration of material within the weather and climate enterprise, highlights the application of rapidly-changing technologies to bring new and powerful tools to disseminate and receive information, and notes efforts being undertaken to better communicate with different populations.

With this background, results of a "real-time" trial of a system used to generate forecasts, by mechanically integrating (that is, combining) judgmental (human) and automated predictions are documented.

The approach utilised by the system is to integrate material from various existing sources on the web to automatically generate improved forecasts for Melbourne and other central Victorian localities. These have yielded an increase in the accuracy of predictions for a broad range of weather elements.

The purpose of the paper is to discuss the application of the aforementioned system to automatically generate new and enhanced weather and climate products in English, Australian Indigenous, and other languages.

After a real-time trial of nearly five years, the mean square error (MSE) of the generated temperature predictions for Melbourne has averaged 0.72°C less than the MSE of corresponding official forecasts.

Looking further ahead, solid statistical relationships exist between historical monthly climate anomalies in Victoria and various measures of the ENSO, Indian Ocean Dipole, and Madden-Julian Oscillation phenomena.

Using this approach in a year-long real-time trial, the correlation coefficients between forecast probabilities that the Melbourne total monthly rainfall, minimum temperature and maximum temperature would be in tercile three, and the corresponding observed total monthly rainfall, minimum temperature and maximum temperature 1961-1990 deciles, were respectively +0.28, +0.25, and +0.32.

The probability that the three correlation coefficients would all be at least +0.25 by chance is 0.8%, suggesting that it is most unlikely that the skill displayed by the experimental monthly climate outlooks arose by chance.

Continuing the trial for a further six months saw the relationship between forecast and observed rainfall strengthen, whilst the relationships between forecast and observed temperatures weakened.

Day & Date	Morning	Afternoon	Min Temp (deg C)	Max Temp (deg C)	Precip Amount (mm)	Precip Prob (%)	9am Wind/ 3pm Wind Melb Apt (km/hr)
Sun-9-1-2011	Shower.	Cloudy.	18	24	3.5	72	SSE 16 SSE 23 Gusts40
Mon-10-1-2011	Partly Cloudy.	Possible Shower.	18	26	0	49	SSW 8 SSE 15 Gusts40
Tue-11-1-2011	Partly Cloudy.	Thunder.	19	26	1.9	51	SSW 8 SSE 15 Gusts40

Melbourne Forecast for Sun-9-1-2011

Cloudy at times during the morning with a few showers gradually clearing. A cloudy afternoon, but without precipitation. Following a very mild night, a mild to warm day. Mainly light wind.

PRECIS SHOWERS CLEARING MIN 18°C MAX 24°C

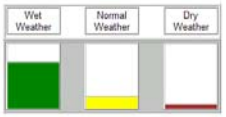
PRECIPITATION Amount 3.5mm Probability 72%

FOG Probability 0% THUNDER Probability 4%

日期	早晨	下午	最低溫度	最高溫度	雨量	雨可能性
星期天 9-1-2011	阵雨	多云	18	24	3.5	72
星期一 10-1-2011	部分多云	可能的阵雨	18	26	0	49
星期二 11-1-2011	部分多云	雷	19	26	1.9	51

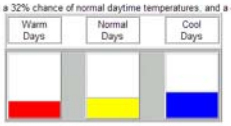
In Melbourne, at this time of the year, a combination of the MEI, the DMI, and the MJO Phase, such as what we have operating now, suggests, over the following 30 days:

RAINFALL: There is a 72% chance of it being wet, a 20% chance of normal rainfall, and a 8% chance of it being dry.



OVERNIGHT TEMPERATURES: There is a 41% chance of warm nights, a 33% chance of normal overnight temperatures, and a 26% chance of cool nights.

DAYTIME TEMPERATURES: There is a 27% chance of warm days, a 32% chance of normal daytime temperatures, and a 41% chance of cool days.



References:

Stern H (2007) Improving forecasts with mechanically combined predictions. Bulletin of the American Meteorological Society (BAMS), June 2007, 88:850-851.

Stern H, Campbell B, Efron M and Cornall-Reilly J (2010), Climate drivers and the potential for monthly outlooks, Australia - New Zealand Climate Forum 2010, 13-15 October 2010, Hobart, Australia: ***http://www.bom.gov.au/events/anzcf2010/abstract-197.shtml***