Assessing the reliability of dynamic and statistical seasonal weather forecasts in simulating hindcast pasture growth rates

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TIA is a joint venture of the University of Tasmania and the Tasmanian Government

Forecasting seasonal pasture growth rates

→ Home-grown feed is a key determinant of dairy business success

→ The ability to determine how pasture growth rates vary temporally is critical to any pasture-based dairy system

→ Forecast of seasonal pasture growth rate **based on historical climate** data from biophysical models provide information relating to the seasonal variation in feed supply

→ <u>However</u>, approaches based on historical data cannot account for *current* atmospheric conditions

→ Seasonal forecast models are now transitioning towards dynamical models that simulate climate physics and **incorporate current global conditions**, e.g. the global circulation model POAMA

Forecasting seasonal pasture growth rates

→ Further work remains in testing approaches to generating seasonal weather forecasts, as well as in determining the forecast length such that simulations become too misleading to be useful in decision making

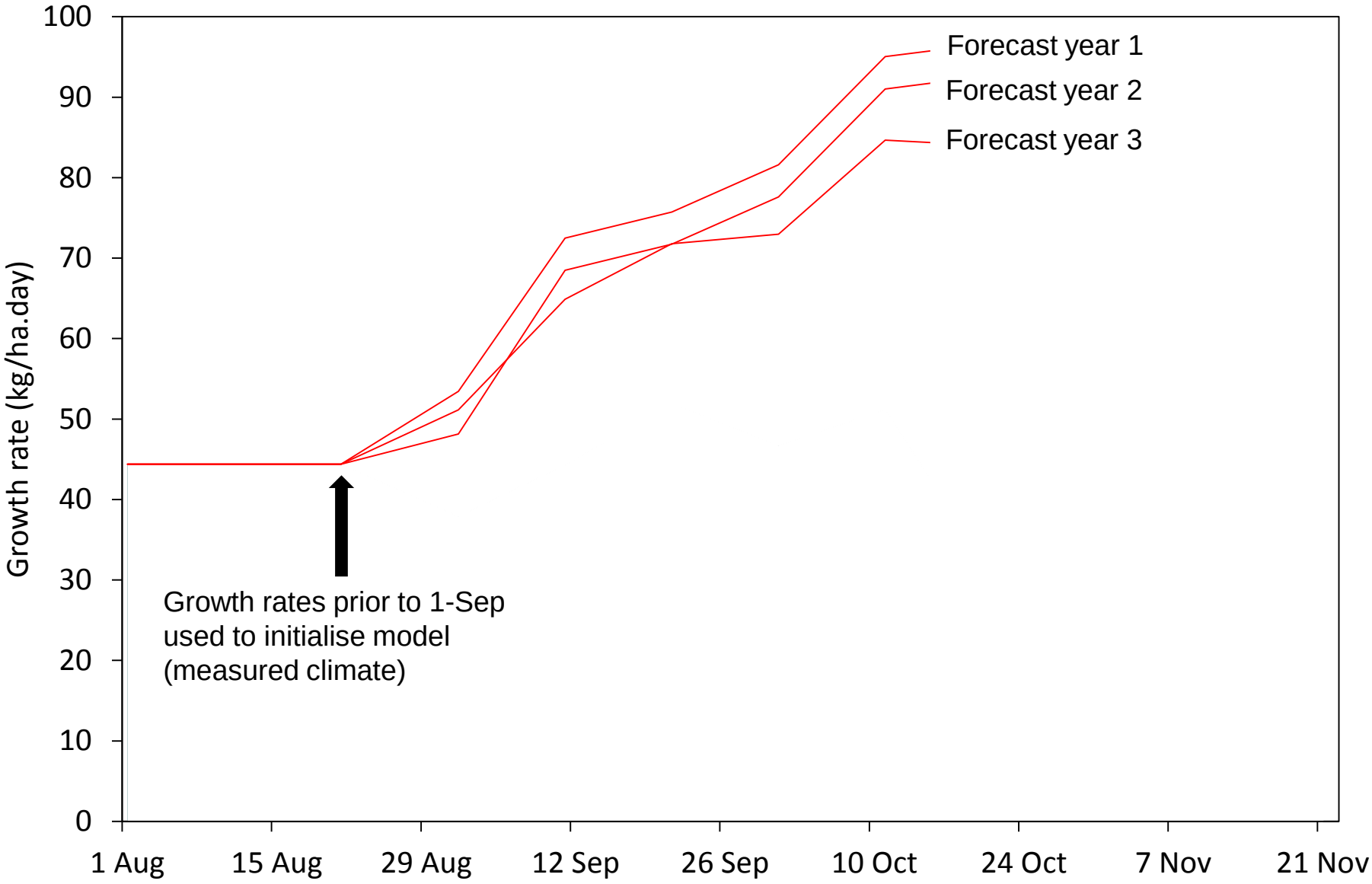
→ Here we compared pasture growth rate forecasts generated using historical data and POAMA with simulated hindcasts

→ POAMA data were downloaded from the Bureau of Meteorology using an automated approach and were bias-adjusted according to site

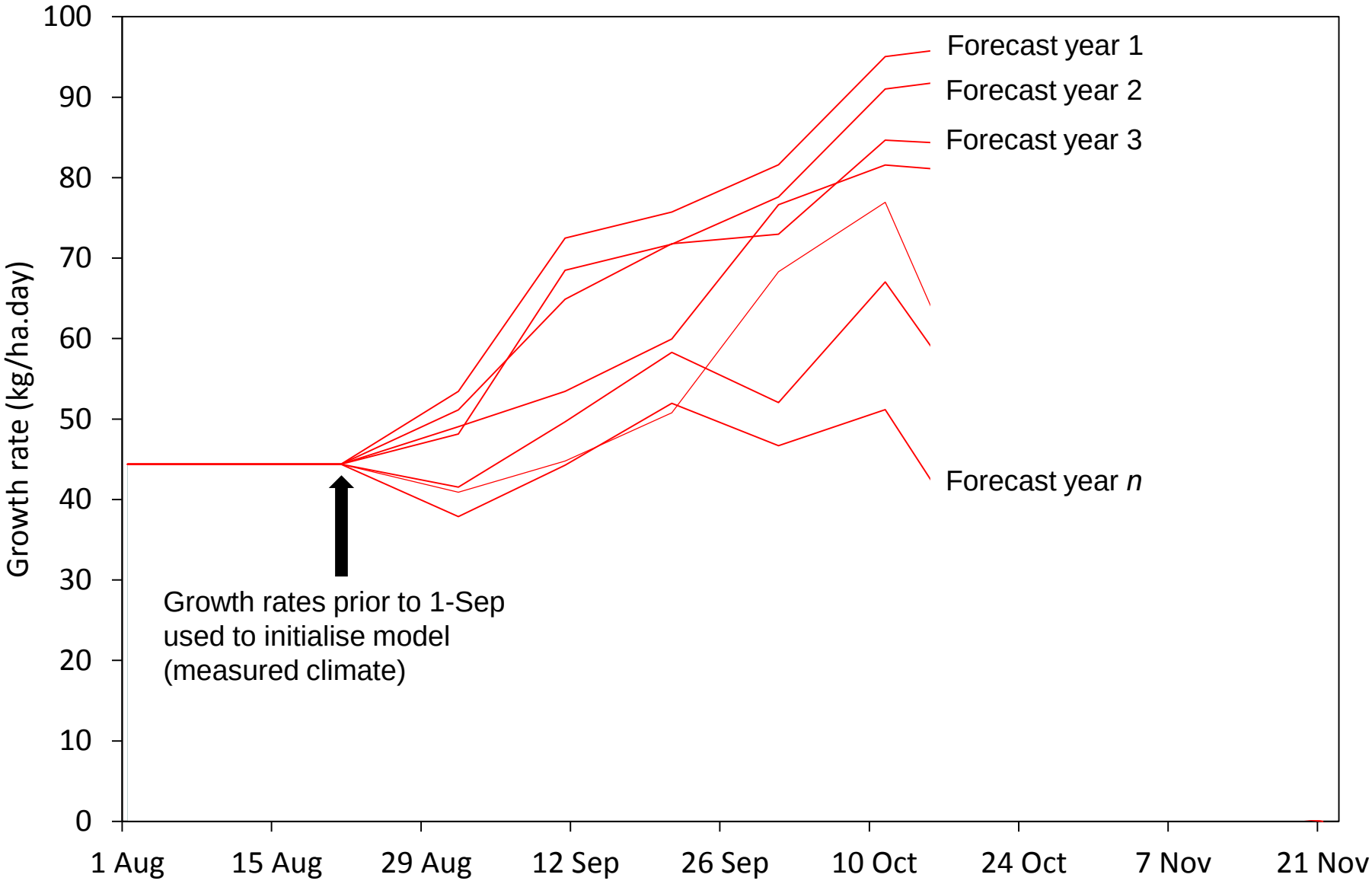
→ Hindcast growth rates were generated using *a posteriori* weather measurements

→ Historical data were used to produce climate forecasts using **a monthly analogue** approach

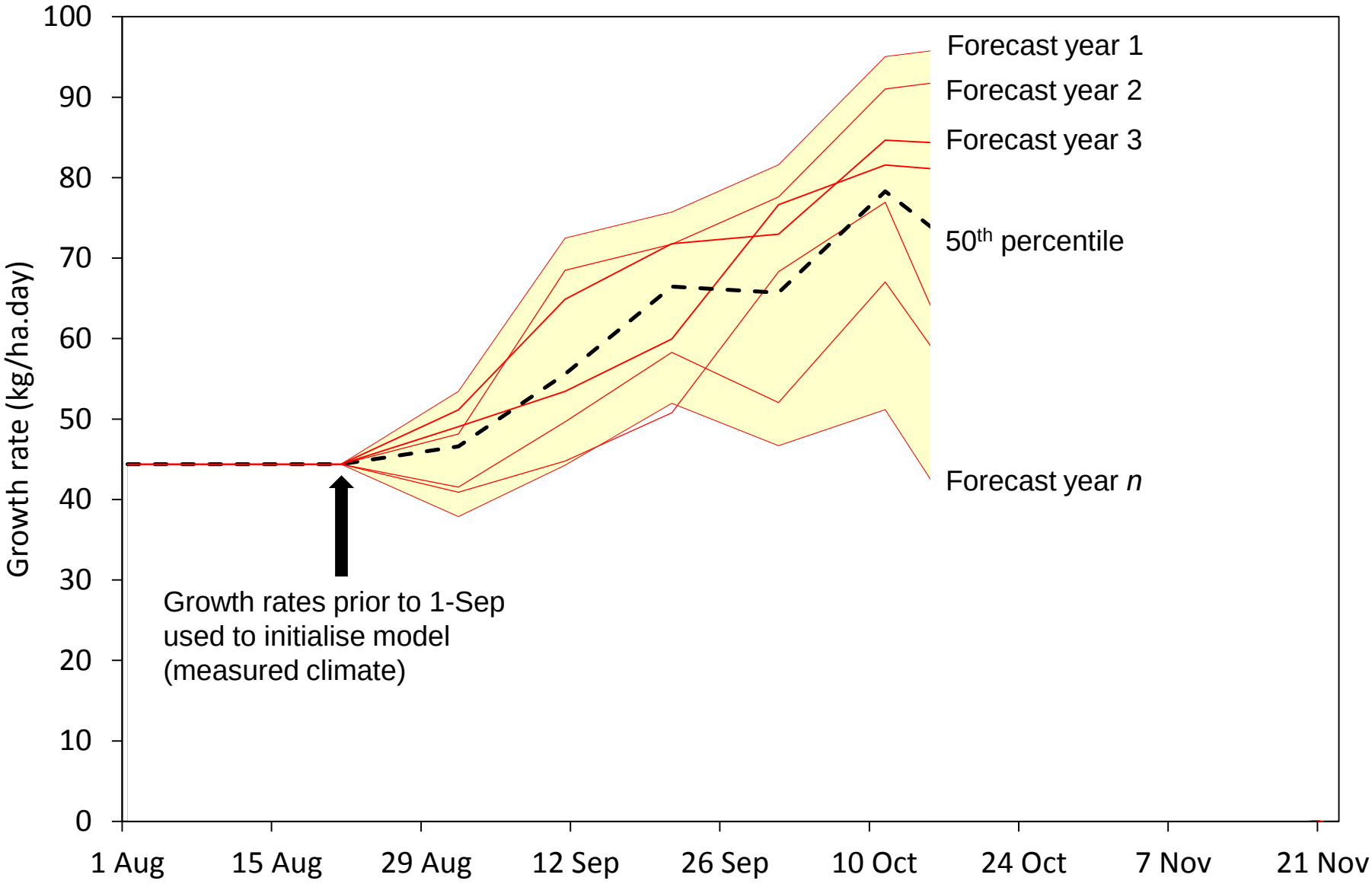
Forecasting seasonal pasture growth rates

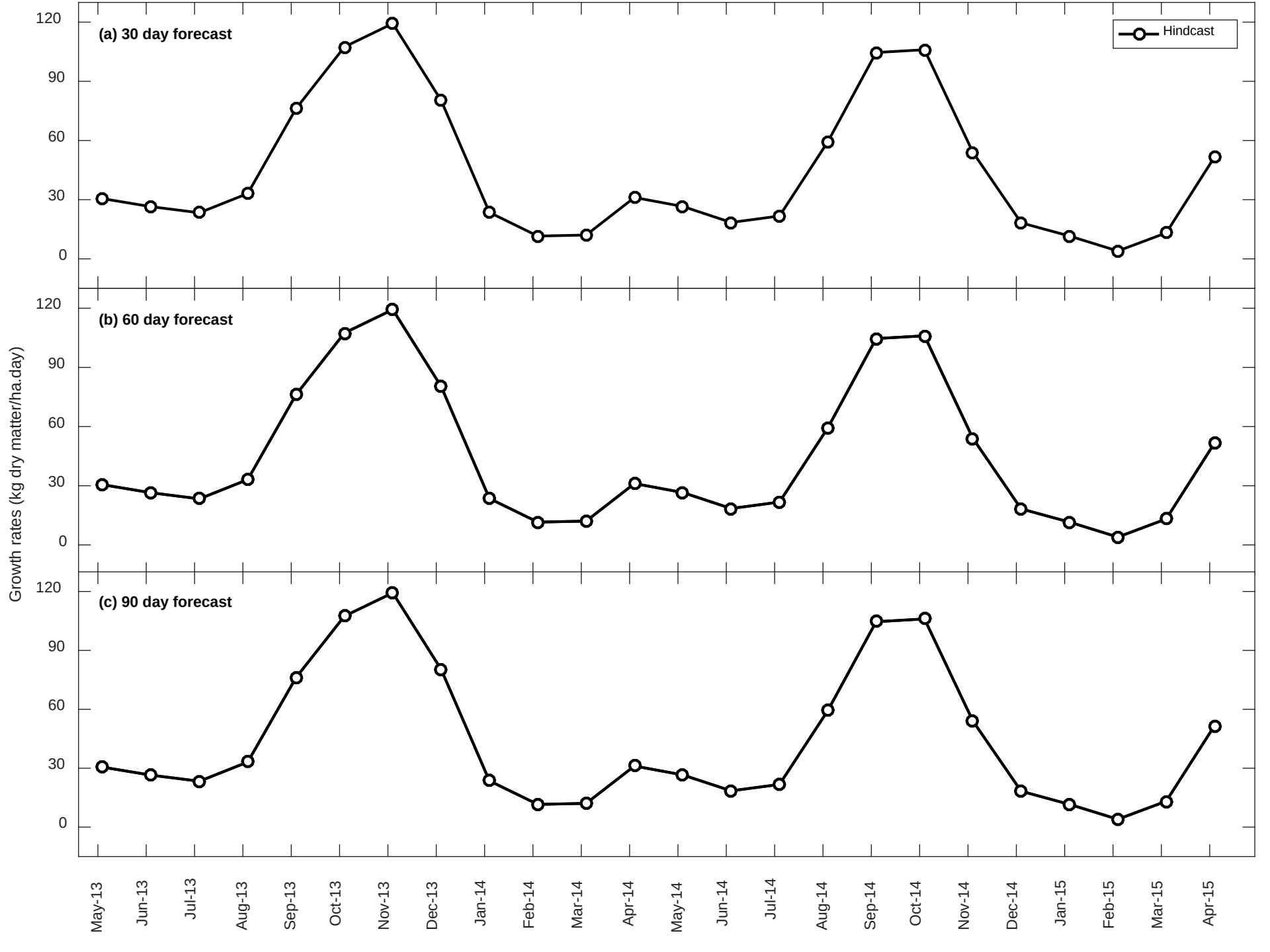


Forecasting seasonal pasture growth rates



Forecasting seasonal pasture growth rates




(a) 30 day forecast
(b) 60 day forecast
(c) 90 day forecast
Hindcast
Growth rates (kg dry matter/ha.day)
0
30
60
90
120
May-13
Jun-13
Jul-13
Aug-13
Sep-13
Oct-13
Nov-13
Dec-13
Jan-14
Feb-14
Mar-14
Apr-14
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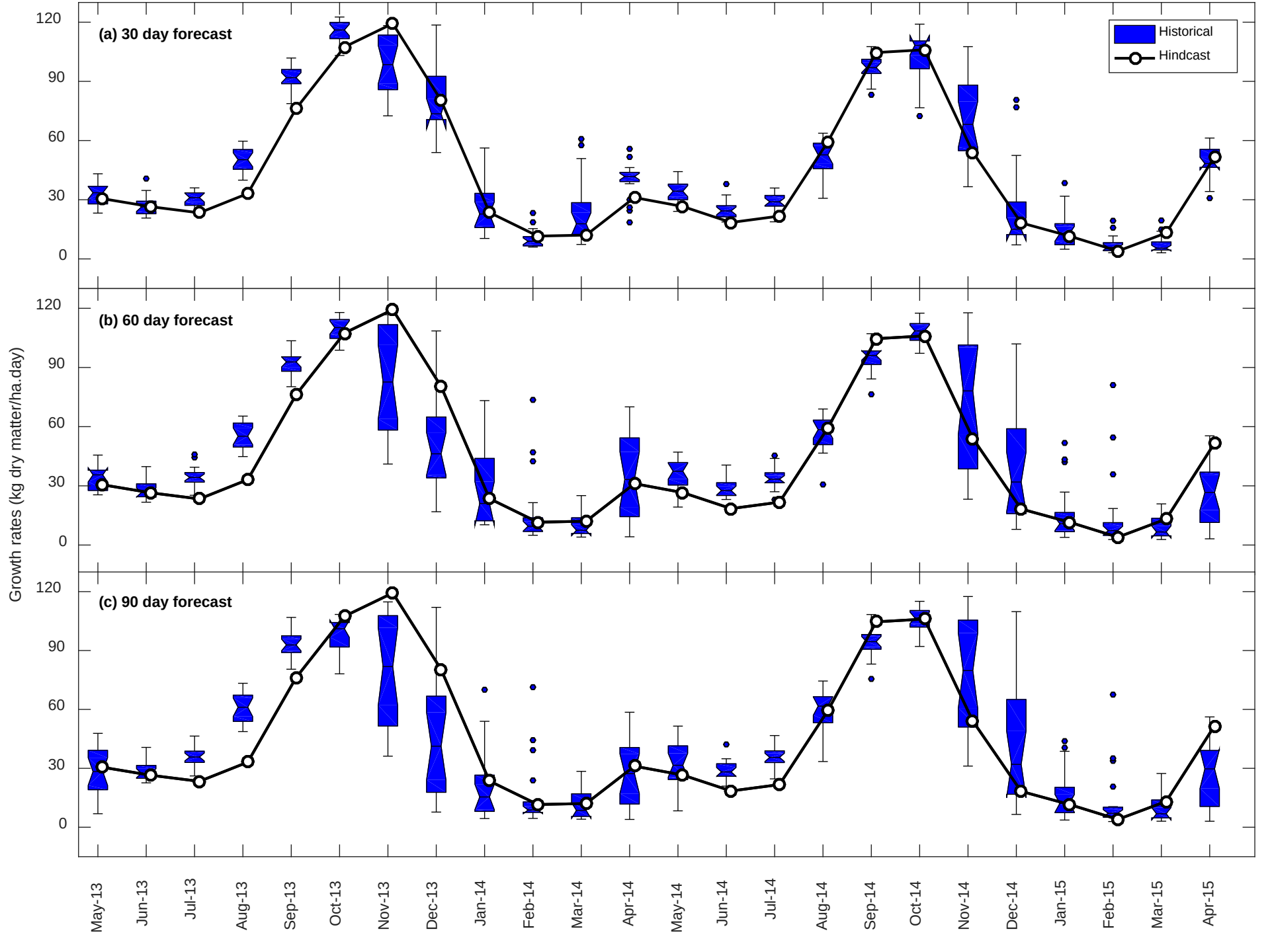
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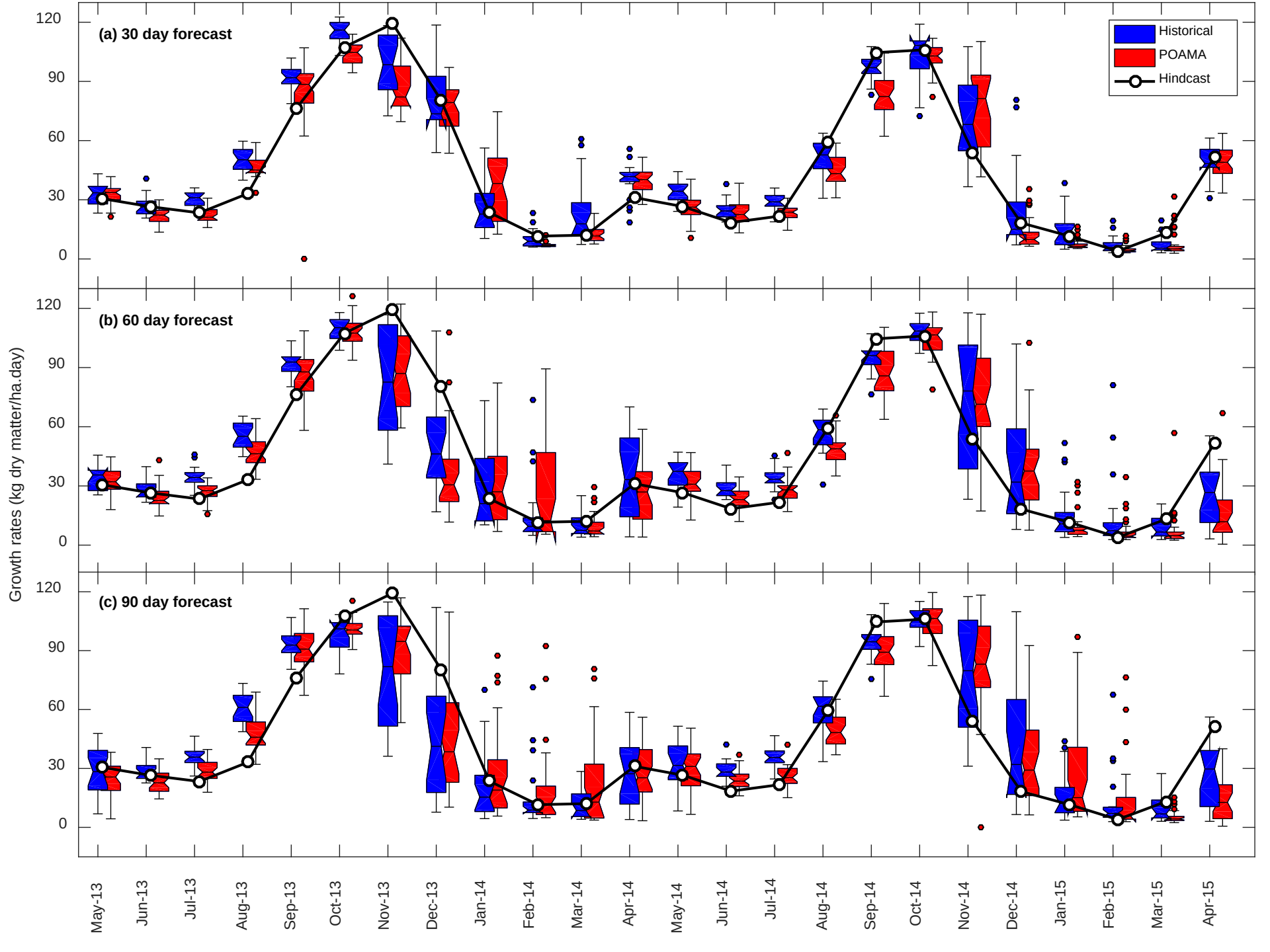
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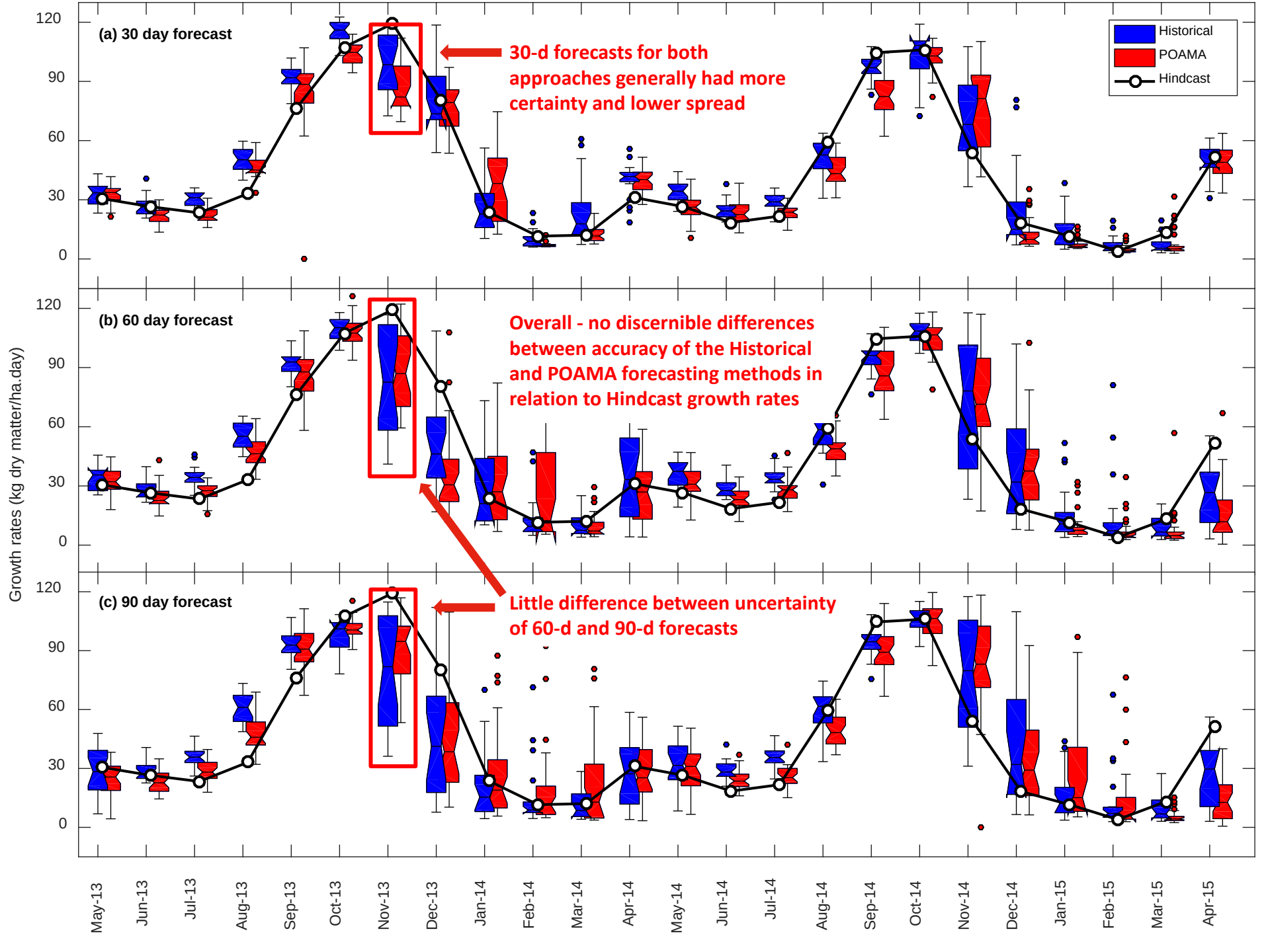
(a) 30 day forecast
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(c) 90 day forecast
Historical
POAMA
Hindcast
30-d forecasts for both approaches generally had more certainty and lower spread
Overall - no discernible differences between accuracy of the Historical and POAMA forecasting methods in relation to Hindcast growth rates
Little difference between uncertainty of 60-d and 90-d forecasts
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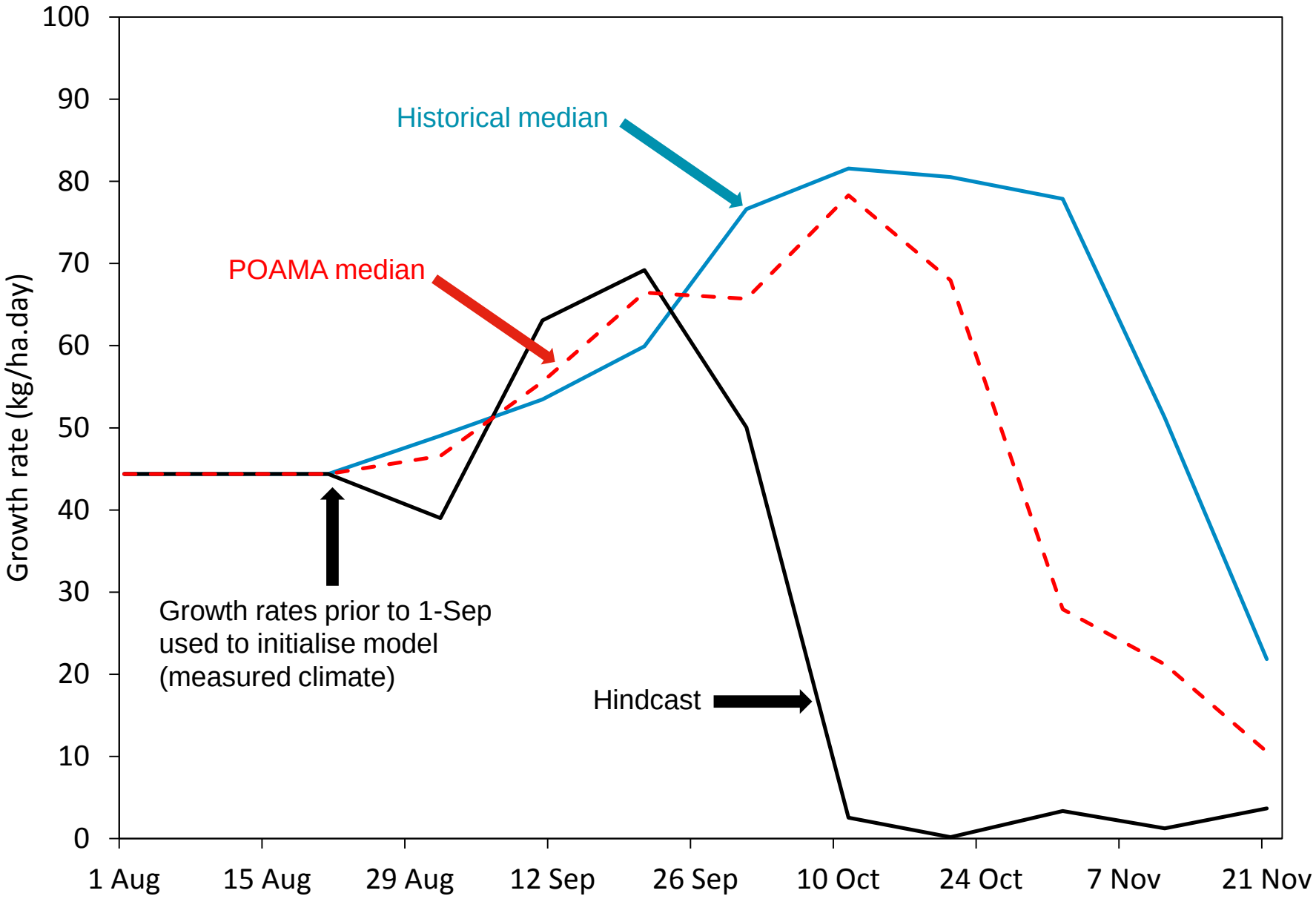
Forecasting seasonal conditions with significant deviation from the norm: growth rates during El Nino in spring 2015



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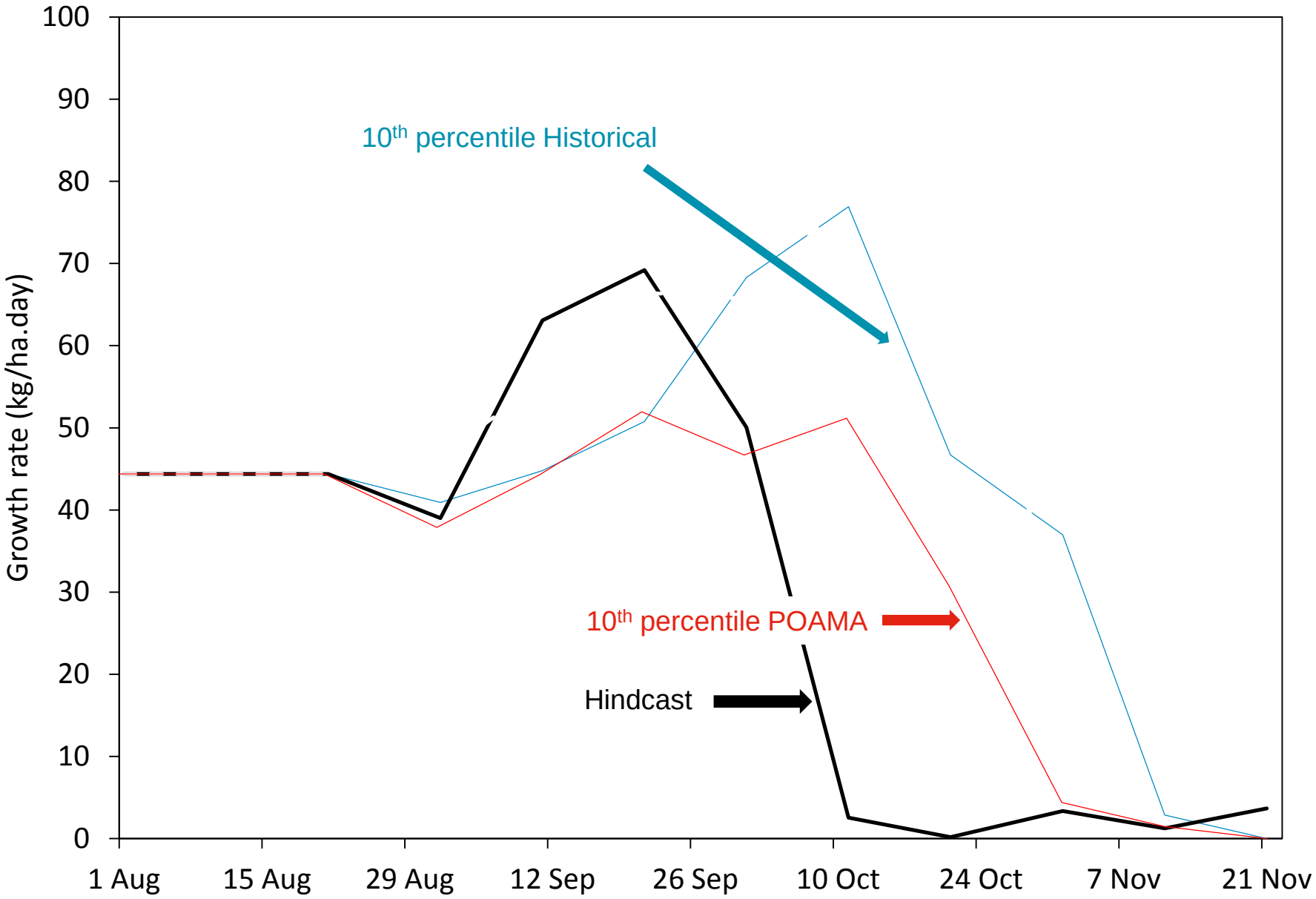
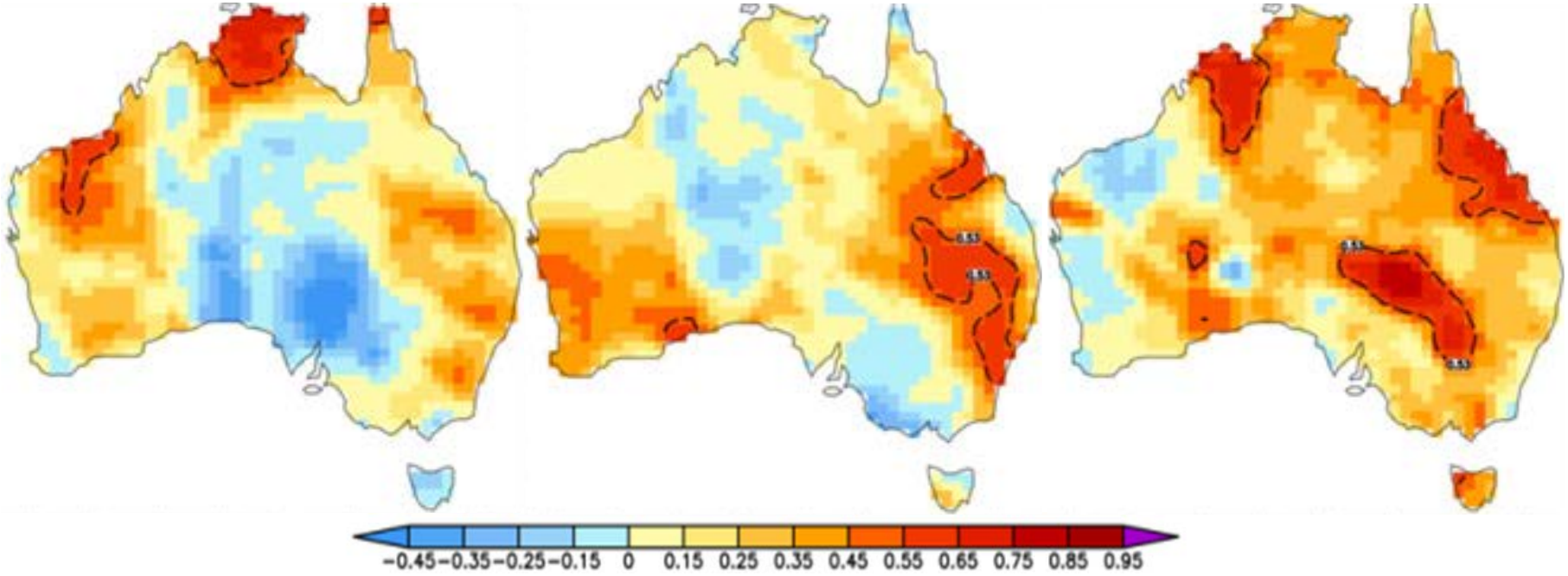


Correlation skill for POAMA-2 for forecasts of seasonal mean rainfall anomalies for the AMJ (left), JJA (middle) and SON (right) seasons



→ Dashed line indicates value above which the correlations are statistically significant (r>0.53 is significant, 95% confidence level)

→ POAMA has low ability to forecast rainfall over three months, regardless of season

→ Very high regional variability in skill

→ The current seasonal climate forecasting comparison needs to be extended to other regions with lower and higher skill

→ Updating POAMA to GloSea5-GC2 in mid 2017 will somewhat improve rainfall forecasts, but considerable remains scope for more improvement in forecasting seasonal rainfall

And so in summary…

- 30 day forecast durations tend to have lower uncertainty than longer forecasts, enabling better predictions of seasonal growth rates

- Little difference between POAMA and historical data when used in biophysical models to simulate pasture growth

- Further work remains in expanding the present work to different regions, since POAMA skill varies considerably

- As GCM forecasts improve, e.g. POAMA to ACCESS next year, so too will our ability to better predict pasture growth rates and crop yields

Acknowledgements

→ Sense-T program: both funding and project colleagues

→ Ross Corkrey for statistical analyses

→ CSIRO

→ Bureau of Meteorology

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Correlation skill for GC2 (top) and POAMA-2 (bottom) for forecasts of seasonal mean minimum daily temperature anomalies for the AMJ (left), JJA (middle) and SON (right) seasons

Dashed line indicates value above which the correlations are statistically significant (r>0.53 is significant, 95% confidence level)