Convective-Scale Ensembles at NIWA

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Since early 2019, NIWA has been running an 18 member ensemble forecast system with a horizontal resolution of ~4.5km over the New Zealand region. Each member is initialised from a member of the UK Met Office-run MOGREPS-G ensemble forecast system and forecasts out to 5 days ahead. A late 2019 update saw the introduction of a second forecast cycle of 18 members and a trial of an extended model domain that included the Tasman Sea, eastern Australia. In this presentation, we describe the NZENS system and ensemble-specific product development (Figure 1) and validation (Figure 2) work completed to date and a subjective analysis of the extended domain trial. An overview of how our forecasters are starting to access and promote this system in their day-to-day forecasting and social media activities and how NIWA's hydrological modellers are harnessing this new tool to investigate ensemble-based flood forecasting will also be discussed.

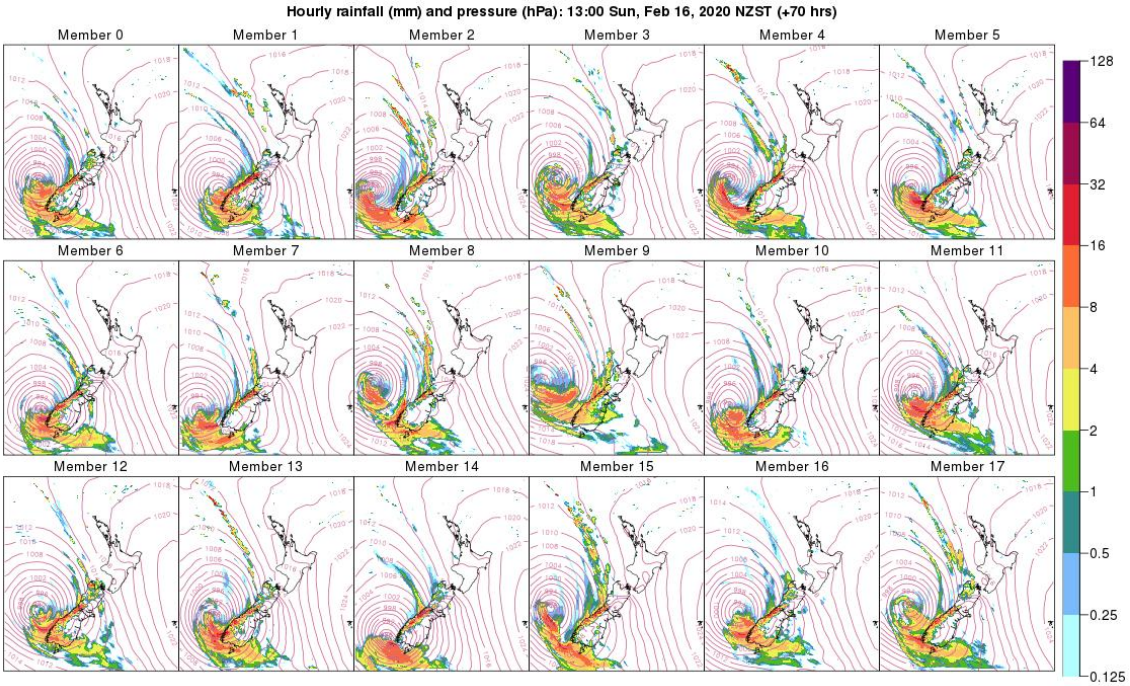

Figure 1. Postage stamp plots from the 18 members of NZENS of rainfall and MSLP for a T+70 hrs forecast of ex-TC Uesi as it approaches New Zealand's South Island on Sunday 16th February 2020.

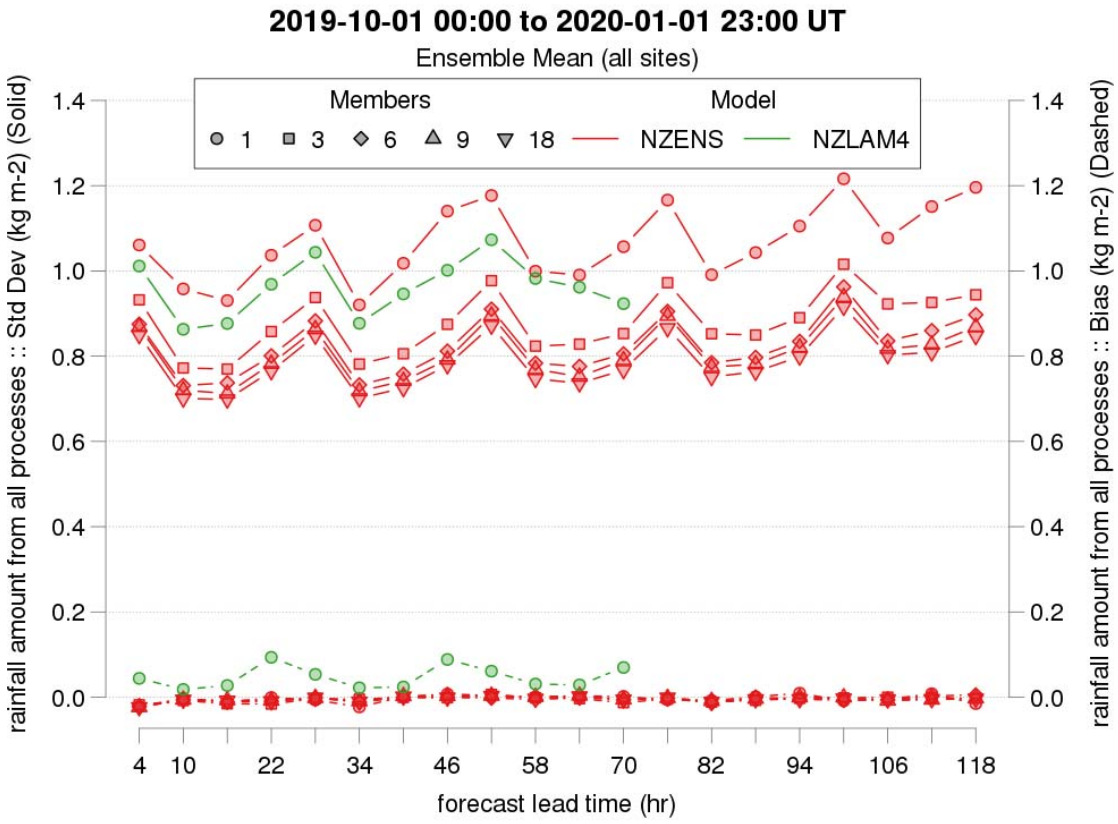

Figure 2. An initial attempt to verify NZENS forecasts of rainfall. The NZENS ensemble mean is seen to verify better than an equivalent resolution data assimilating deterministic model (NZLAM4) for all but n=1 ensemble members, with little additional skill gained beyond n=6 members.

Finally, we will discuss some proposals for how ensemble perturbations - used to generate different but equally likely model analyses that sample the forecast model's analysis error - could be generated and ask whether any of them have the potential to improve our ensemble forecasting systems. Such methods might include perturbed observation errors, observation thinning, perturbed model ancillary datasets and perturbed model physics. Initial thoughts and suggestions for future work on these approaches will be presented.