Use and impact of satellite data in the NZLAM mesoscale model for the New Zealand region

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Status of NZLAM developments

- Description of the NZLAM model
- Summary of satellite data use
- Quantitative verification: framework and results
  - comparison of global and LAM forecasts
  - impact of ATOVS data
- Conclusions and future directions

The NZLAM model

- Limited Area Model

  Met Office UM version 4.5

  324x324 grid pts, 38 levels

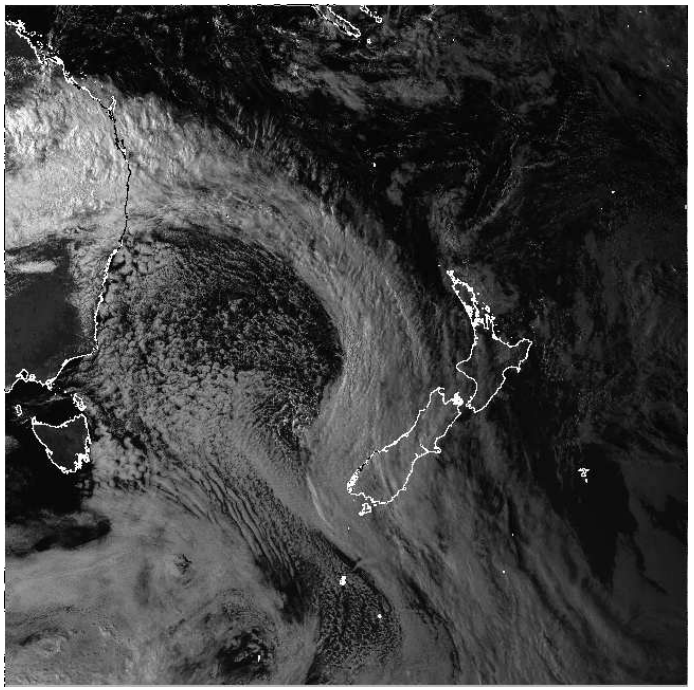
  6 pt LBC, hourly update

- Data assimilation

  3D-VAR analysis

  3-hour cycle

  surface, upper air, satellite



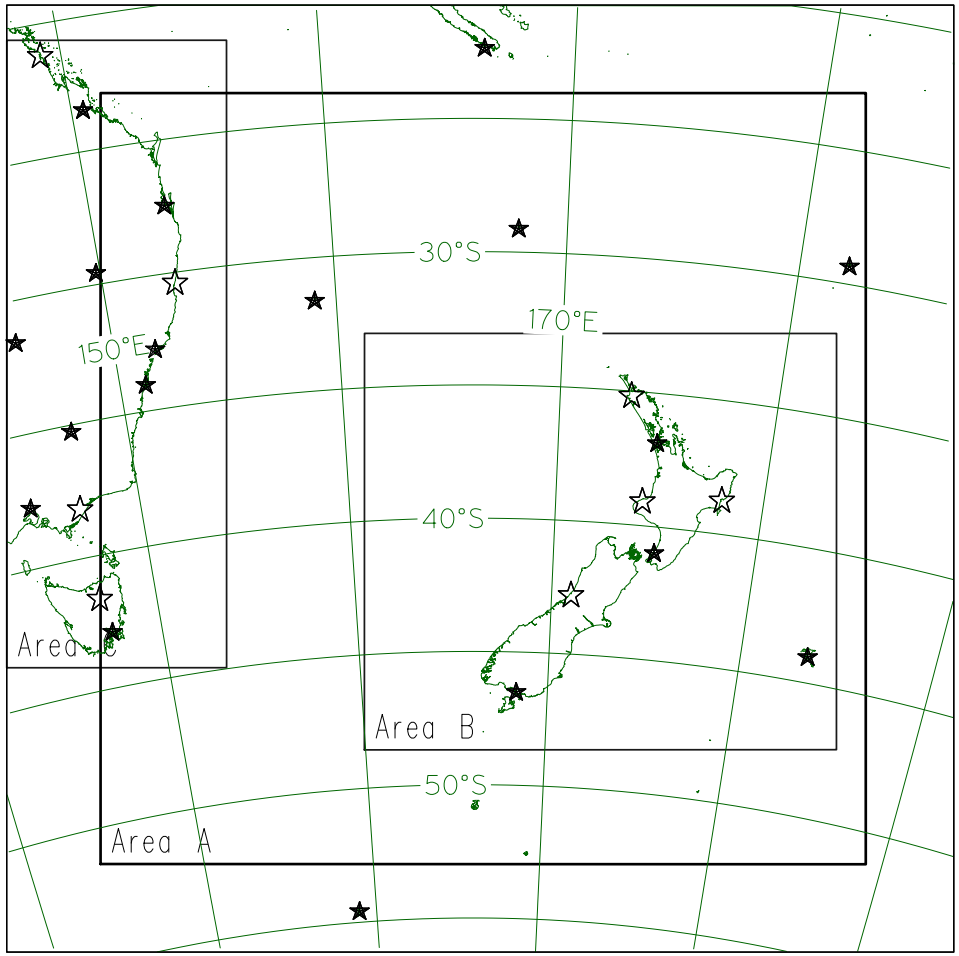
Current satellite data use

- TOVS/ATOVS : direct radiance assimilation
  - NOAA-14: HIRS 2 3 4 5, MSU 2 3 4
  - NOAA-15: AMSU 4 5 6 7 8 9 10 11
- SSMI : 1D-VAR retrievals of surface wind speed
- SATWINDS : atmospheric motion vectors

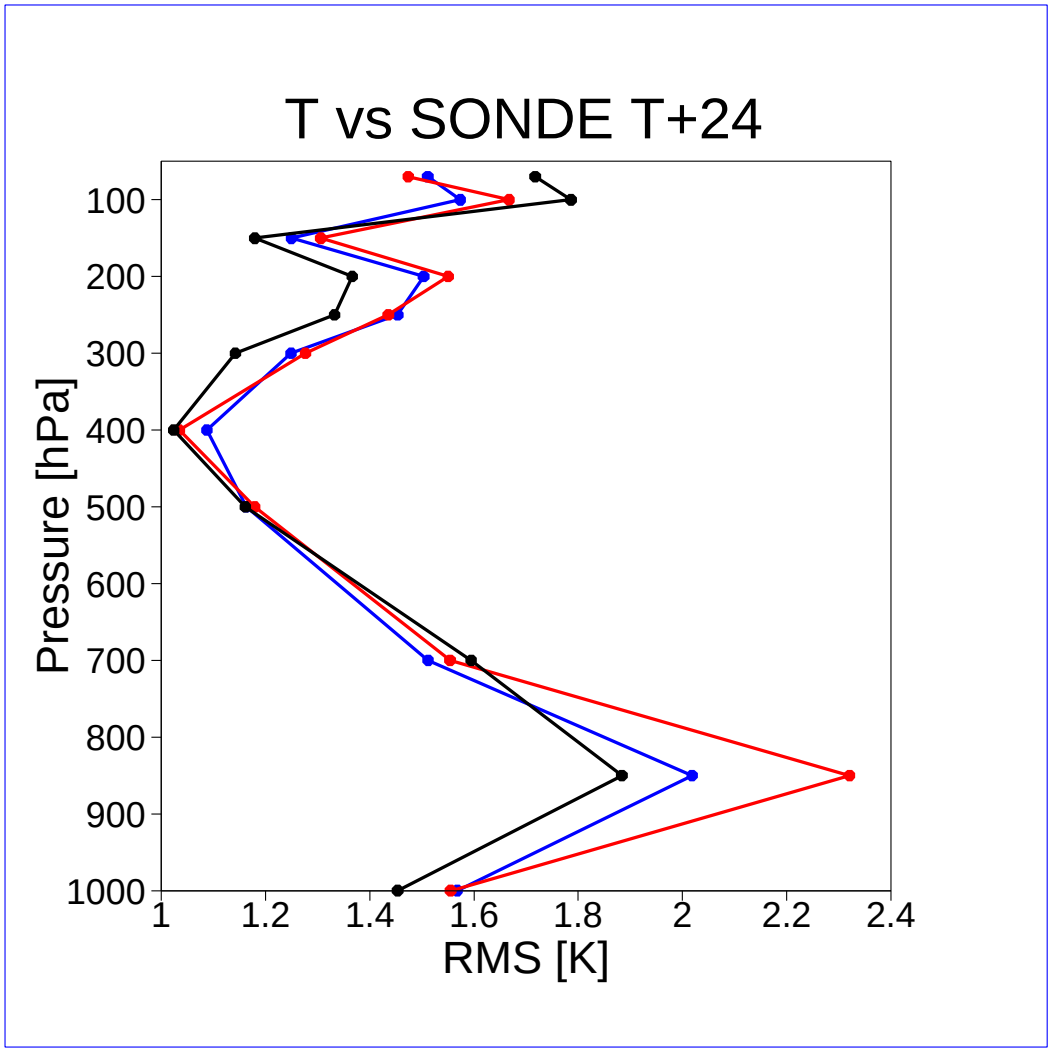
NZLAM verification

- Forecasts from 00Z and 12Z out to 48 hours
- verification vs TEMP PILOT AMDAR SYNOP at 6 hourly intervals
  - global model, variational data assimilation
  - NZLAM, variational data assimilation
  - NZLAM, interpolated global analyses (pseudo-analysis)

Location of sonde stations



Comparison of modelled temperatures

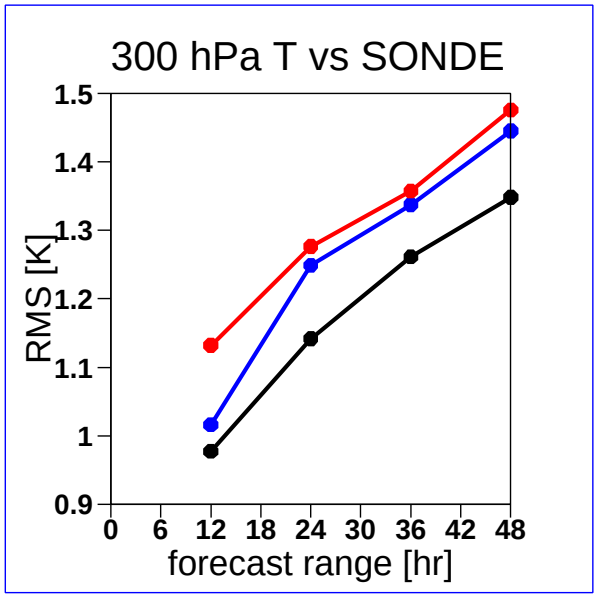


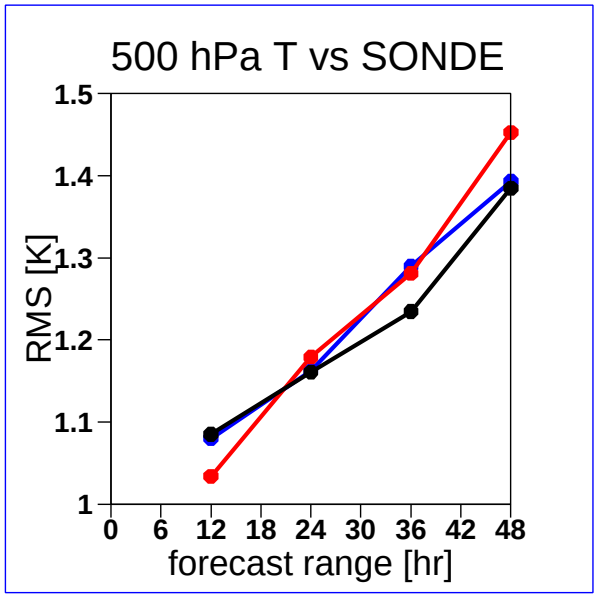
Global

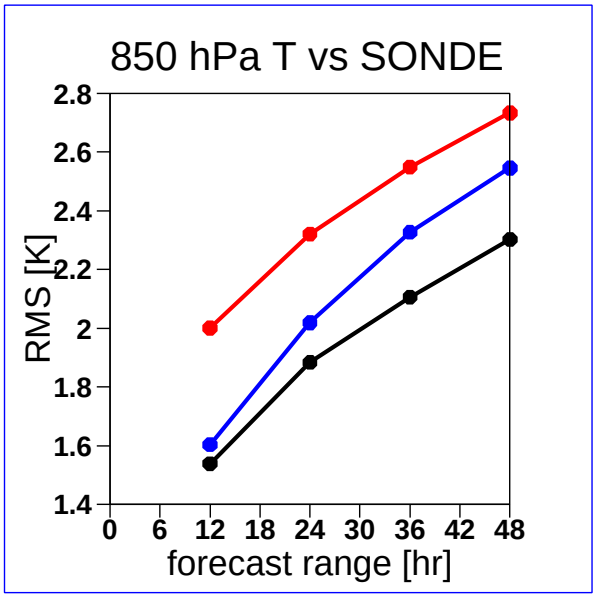
NZLAM assimilation

NZLAM interpolation

Comparison of modelled temperatures

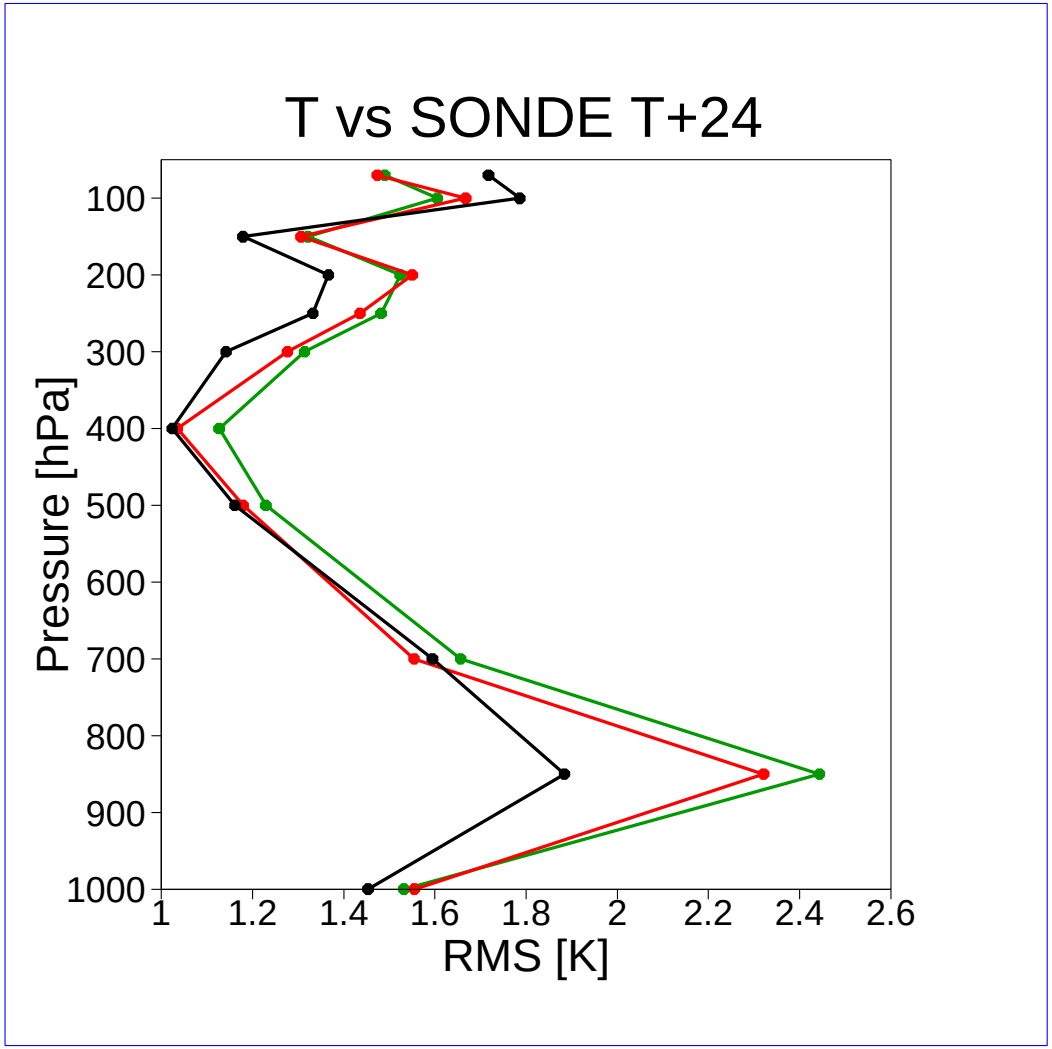






– Global model – NZLAM assimilation – NZLAM interpolation

Impact of assimilating ATOVS data in the NZLAM

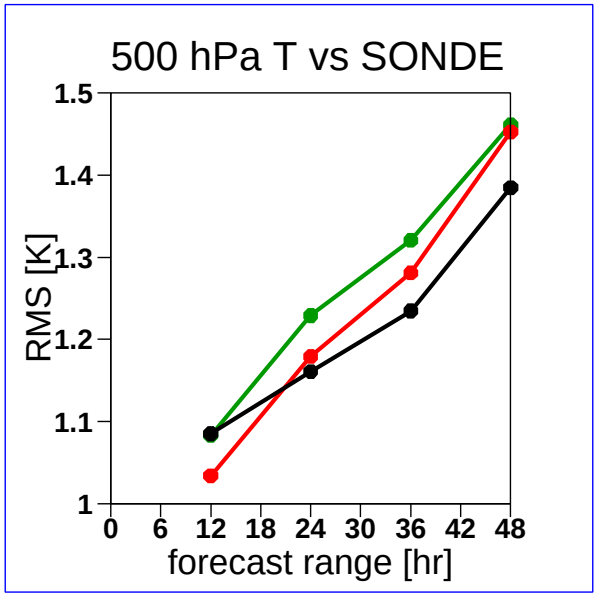


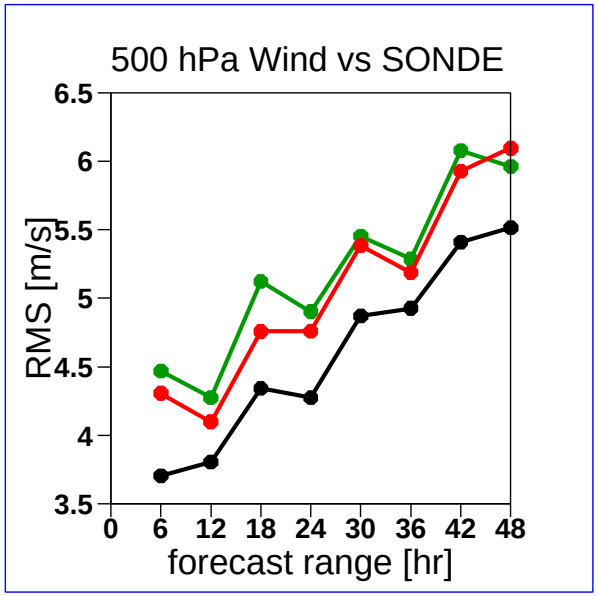
Global

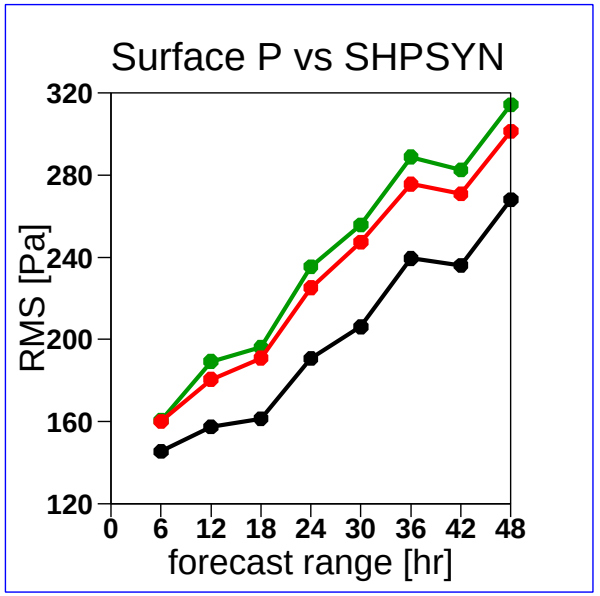
NZLAM
ATOVS

NZLAM
No ATOVS

Impact of assimilating ATOVS data in the NZLAM







– Global model – NZLAM ATOVS – NZLAM No ATOVS

Conclusions

- large scale flows appear to be well modelled (constrained by LBC and data assimilation)
- differences in modelled and observed small scale structure, particularly in the boundary layer
- small scale structures governed by LAM model physics (largely unconstrained by data or LBC)

Areas of on-going research

- extend verification
  - distinguish poorly modelled physical processes and position or timing errors
  - quantitative scale dependent verification
- improve background error covariance estimates
- extend use of satellite data (humidity, SST)

Future directions

- Operational mesoscale forecasting system
- Meteorological input for hazard prediction models
  - hydrological models
  - storm surge and wave models

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