On the use of NAEFS in public forecast generation

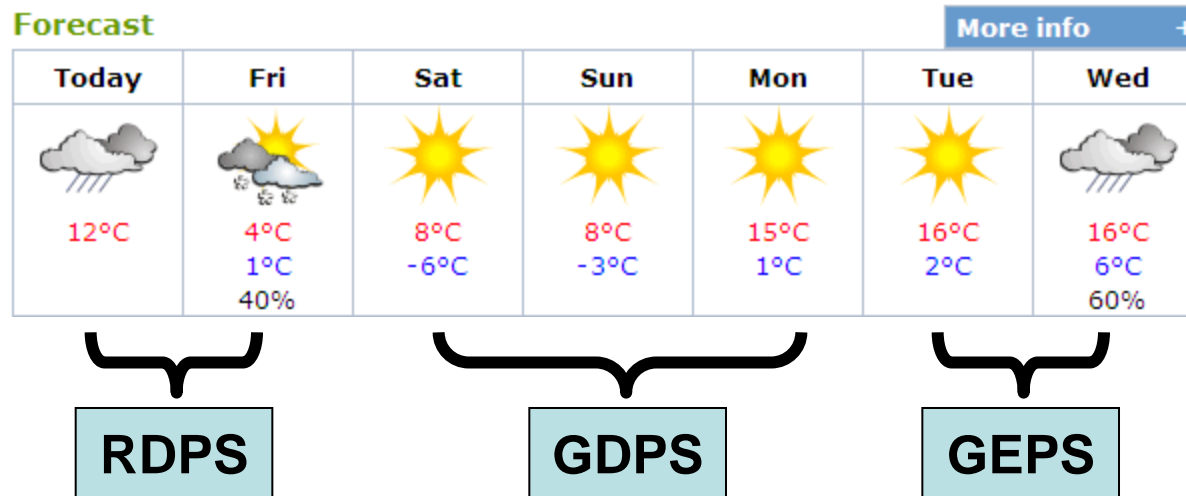**Stéphane Beauregard (CMC)**

Guylaine Hardy (CMC)

Franco Petrucci (CMC)

6th NAEFS workshop

Monterey, CA, May1st 2012

Context: Deterministic public forecasts

- **Public forecast** in Canada are provided for **days 1-7**
- **Regional Deterministic** Prediction System: **days 1-2**
- **Global Deterministic** Prediction System: **days 3-5**
- **Global Ensemble** Prediction System: **days 6-7**
  - Deterministic forecast from the average of the ensemble

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Forecasts by averaging the ensembles

- Weather elements (POP6, POP12, temperature, cloud cover) are produced by a **Perfect Prog** (PP) technique applied on each member of the ensemble.

- The 21 (or 42 for NAEFS) statistical values for each parameter are then **averaged** to produce single values.

- Average of the Direct Model Output for all the others parameters (winds, thickness, vertical movement…)

- Some weather consistency rules are applied on the average forecast

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Some questions

- **Is there skill after day 7?**

- **Should the GEPS be used before day 6?**

- **Impact of using NAEFS for day 6 and 7 forecast?**
  - Hard to improve on the mean going from 20 to 40 members
  - Considerations: scores, contingency, post-processing costs

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Harder questions (not answered here!)

- **How to use probabilistic information from ensemble forecasts in public forecast**
  - Design difficulties: has to be easy to understand
  - Technical difficulties: automated system designed for deterministic forecasts
- **For which lead time and how should Regional EPS be used for public forecasts?**
  - Same difficulties as previous question
- Hard answer: **Need a complete redesign of the automated forecast system.**

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Verification

- **Fall 2011**
  - 16 September 2011 to 15 December 2011
- **Winter 2012**
  - 16 December 2011 to 15 March 2012
- Verification against **observation**
- **131 stations** over Canada
- ~10000-11000 Cases
  - Some missing cases for NAEFS (automated forecast system run in development)

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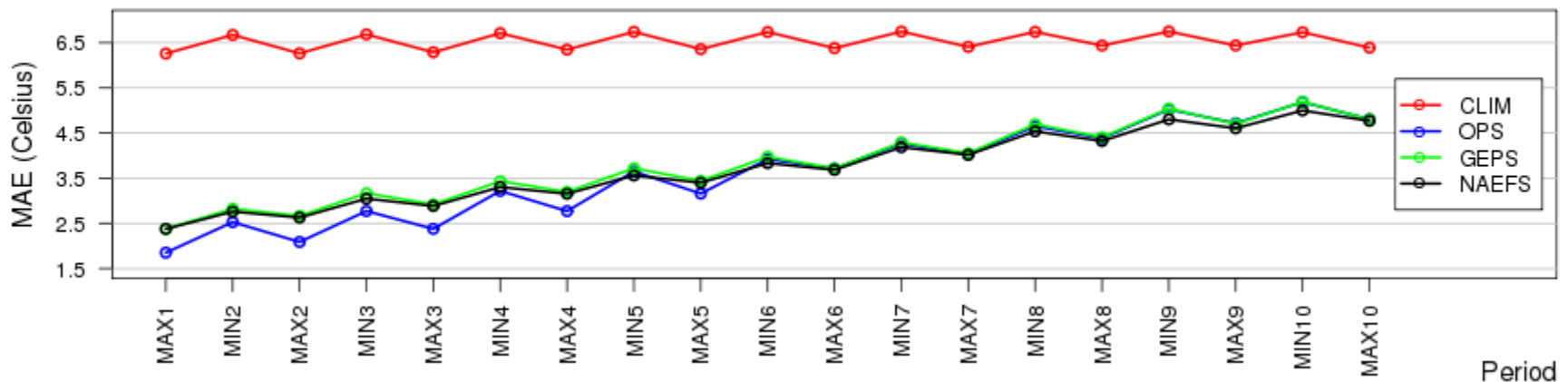
Temperature: MAE

Max/Min Temperature - Mean Absolute Error

2011-09-16 to 2011-12-15   Fall season   131 stations
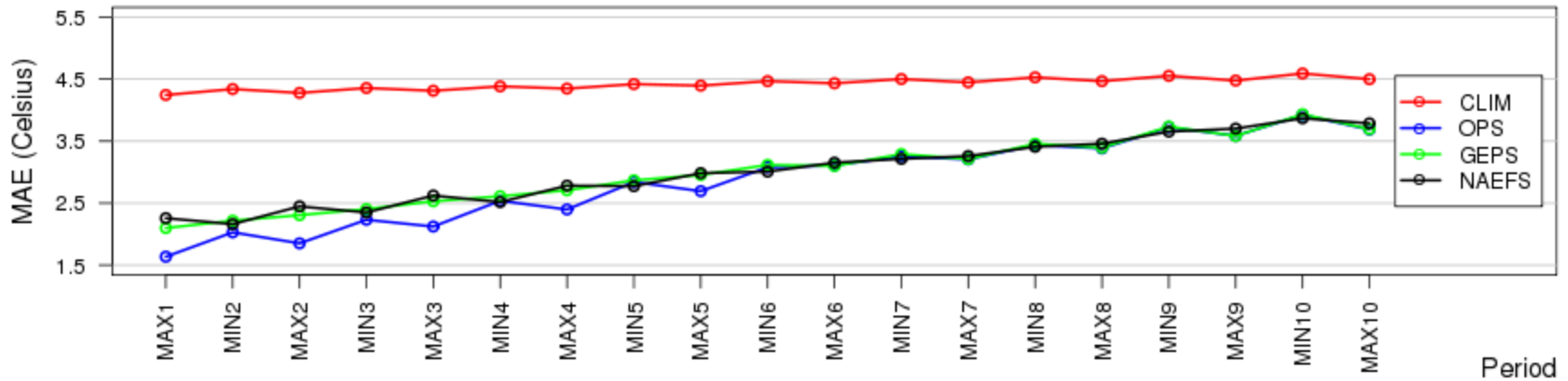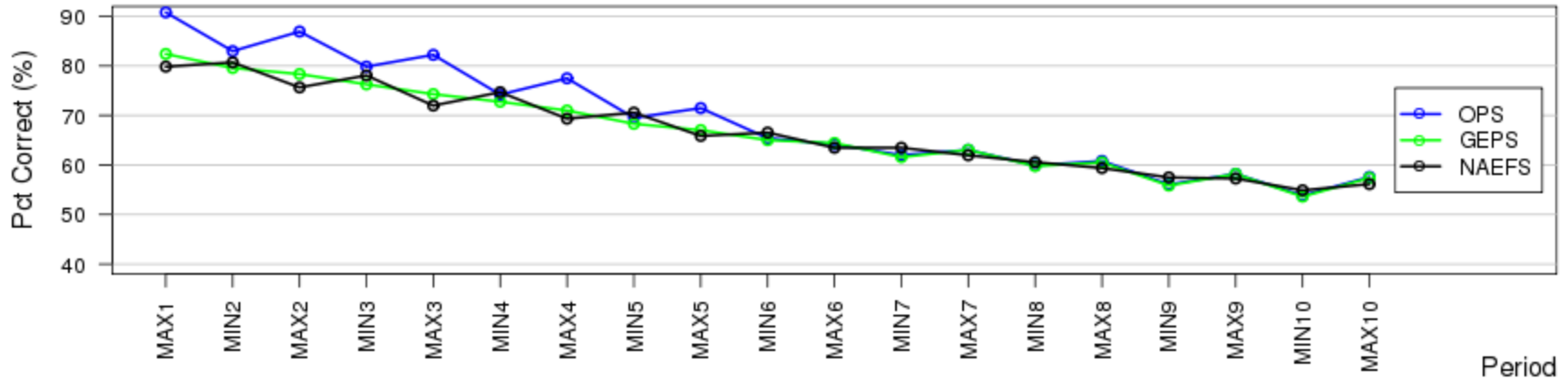
Max/Min Temperature - Mean Absolute Error

2011-12-16 to 2012-03-15   Winter season   131 stations

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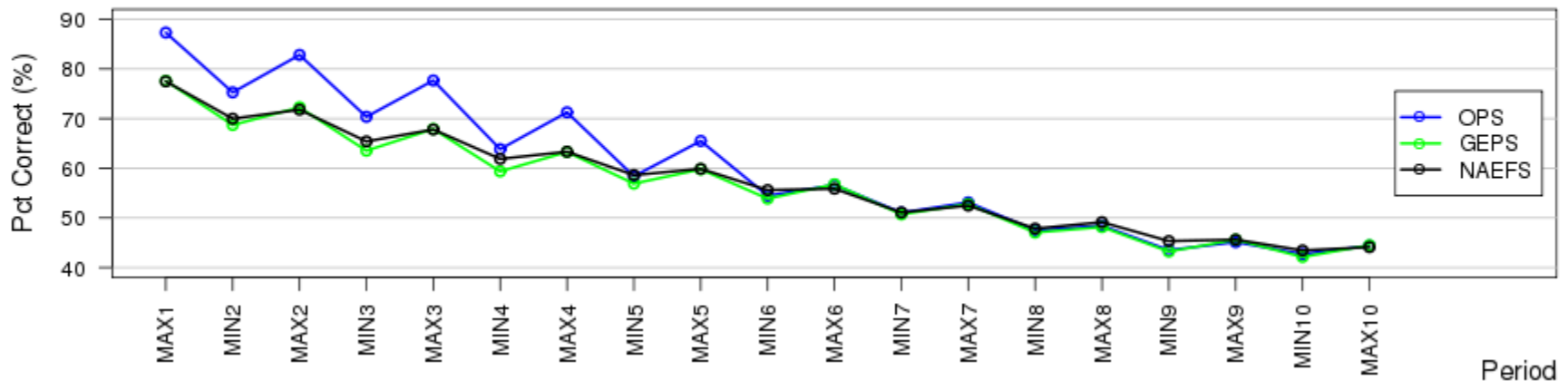# Temperature: Pct correct +/- 3degC

Max/Min Temperature - Pct Correct +/- 3degC
2011-09-16 to 2011-12-15   Fall season   131 stations

Max/Min Temperature - Pct Correct +/- 3degC
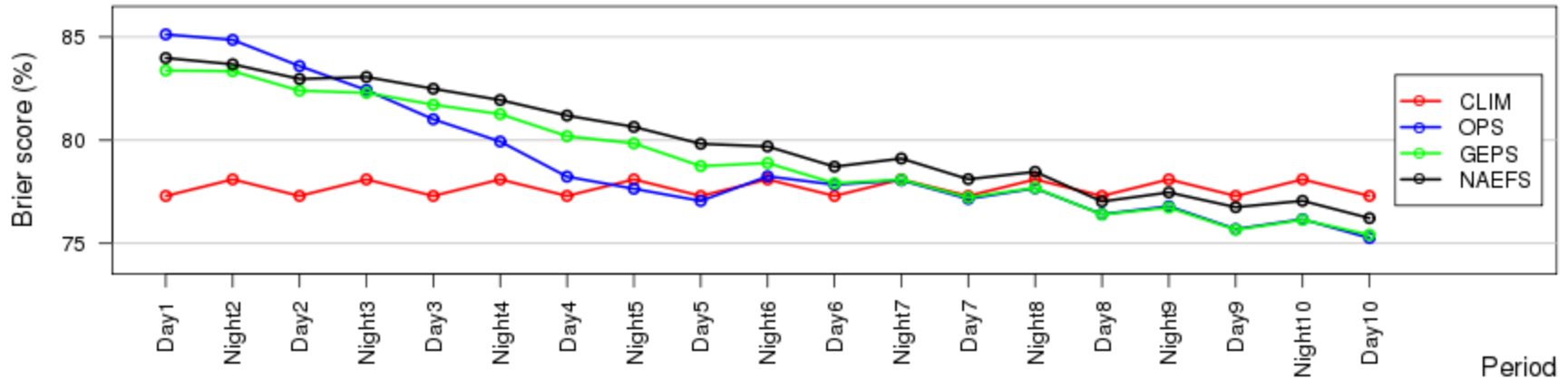2011-12-16 to 2012-03-15   Winter season   131 stations

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Temperature: comments

- OPS still better for MAX up to day 5, but not as clear for MIN

  – UMOS applied on RDPS and GDPS
  – Perfect prog applied on GEPS and NAEFS

- NAEFS seems to improve for MIN, but seems to degrade for MAX in first few days in Fall

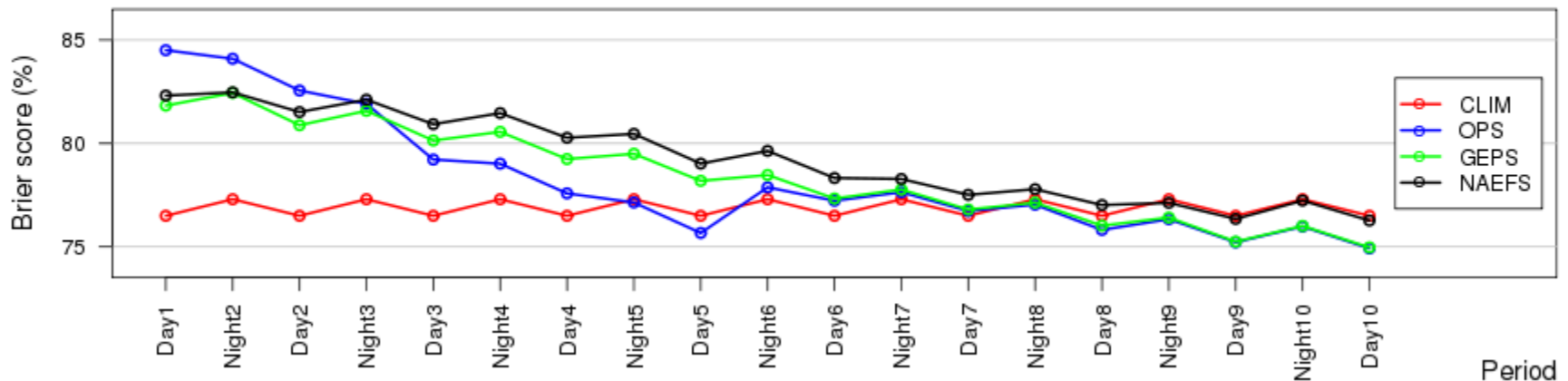- NAEFS and GEPS do better than climatology to day 10, and probably beyond

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Precipitation: Brier Score

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Precipitation: comments

- NAEFS and GEPS improve on OPS for day 3-5
  - UMOS applied on RDPS only
  - Perfect Prog applied on GDPS, GEPS and NAEFS
- NAEFS improves slightly on GEPS for the whole period
- NAEFS does better than climato up to day 7

- Need to test PoP from direct ensemble count

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Cloud Cover: Correlation Coefficient

Cloud Cover - Correlation Coefficient
2011-09-16 to 2011-12-15   Fall season   131 stations

Cloud Cover - Correlation Coefficient
2011-12-16 to 2012-03-15   Winter season   131 stations
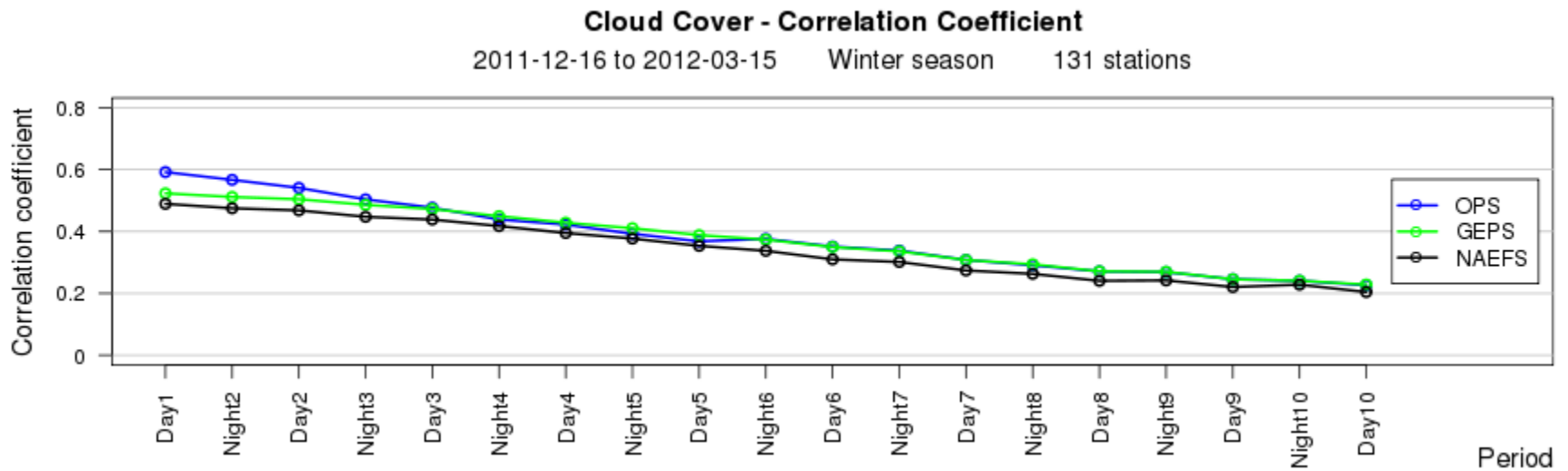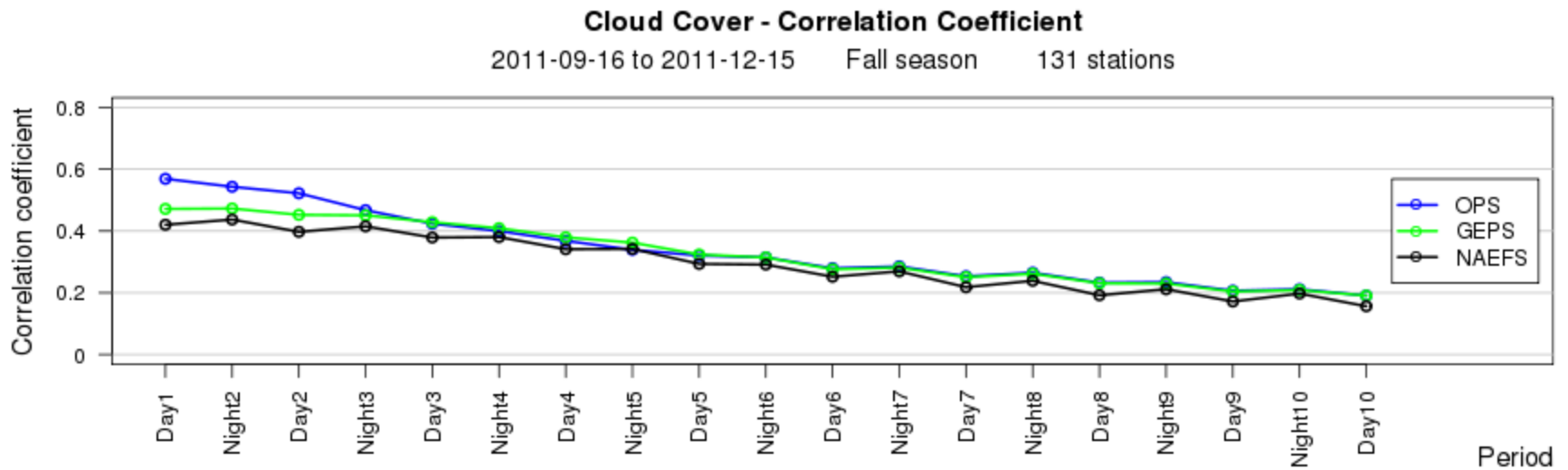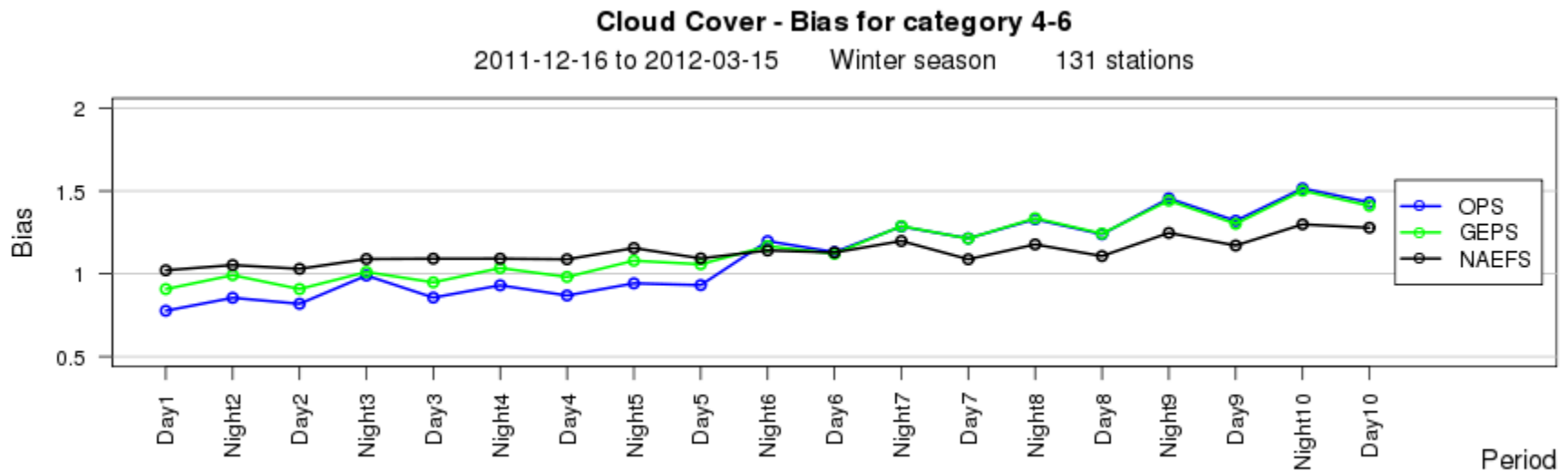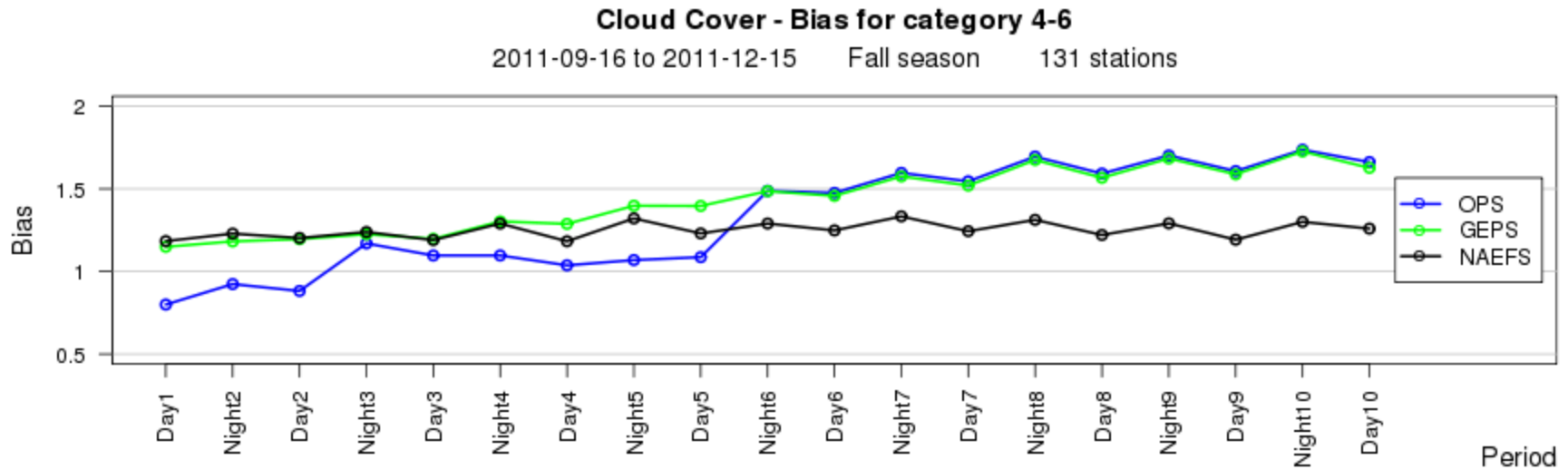
Cloud Cover Corr. Coeff. Comments

- GEPS on par with OPS at day 3
  - UMOS applied on RDPS only
  - Perfect prog applied on GDPS, GEPS and NAEFS
- GEPS better than NAEFS

- Perfect Prog technique used for clouds is quite dated
- Direct model outputs need to be tested

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Cloud Cover: Bias for cat. 4-6

Cloud Cover - Bias for category 4-6
2011-09-16 to 2011-12-15   Fall season   131 stations

Cloud Cover - Bias for category 4-6
2011-12-16 to 2012-03-15   Winter season   131 stations

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Cloud Cover Bias categ. 4-6 Comments

- GEPS and NAEFS overforecast category 4-6 in Fall

  – GEPS worst after day 5

- OPS underforecast day 1-2 in Fall and day 1-5 in winter

- NAEFS improves on GEPS in Fall after day 5, and after day 7 in Winter

- NAEFS and GEPS has better bias than OPS for Winter

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Work still to be done

- Compare Perfect prob PoP and clouds with ensemble count pop and model clouds
- Verification for other seasons
- Are the differences in scores statistically significant?
- Tests REPS integration
- More scores to be used
  - **Flip-Flop index**: an index that computes the change in the forecast between runs
  - Large changes going back and forth (flip-flop) are undesirable in public forecasts
  - Ensembles are less prone to flip-flops

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Thank you!

Comments? Questions?

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