

# Canadian Marine Ensemble Forecast System

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Environment Canada**

**Waves Workshop - Halifax 2009**

**Object:**

**Probabilistic forecasts of  
wave and wind properties**

# Outline

- **Forecast Models**

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  - **Kernel Density Estimators (KDEs)**
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  - Results

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- **Ongoing/Future Work**

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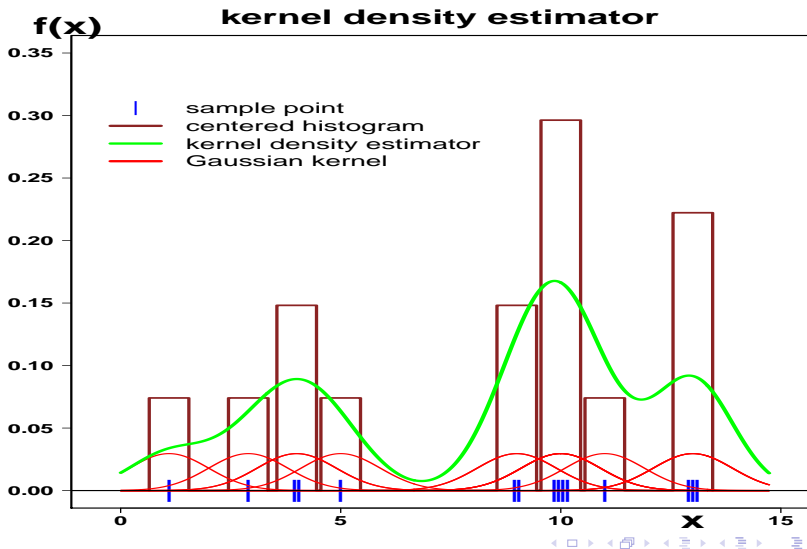
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<sup>1</sup>  Jul/2007

## Probabilistic Models - Empirical

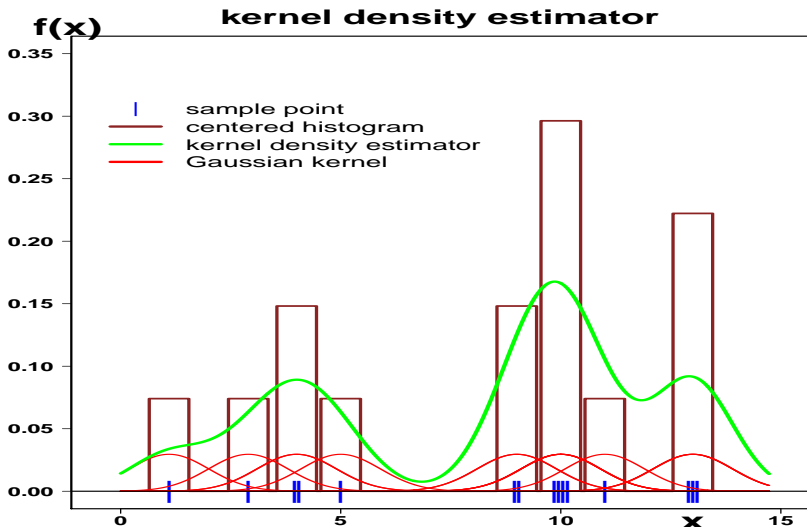
$$P(SWH > 3m) = \frac{\# \text{ ensemble members forecasting } SWH > 3m}{20}$$

# Probabilistic Models - Kernel Density Estimators



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$$P(SWH > 3m) = \int_3^{\infty} f(x) dx$$



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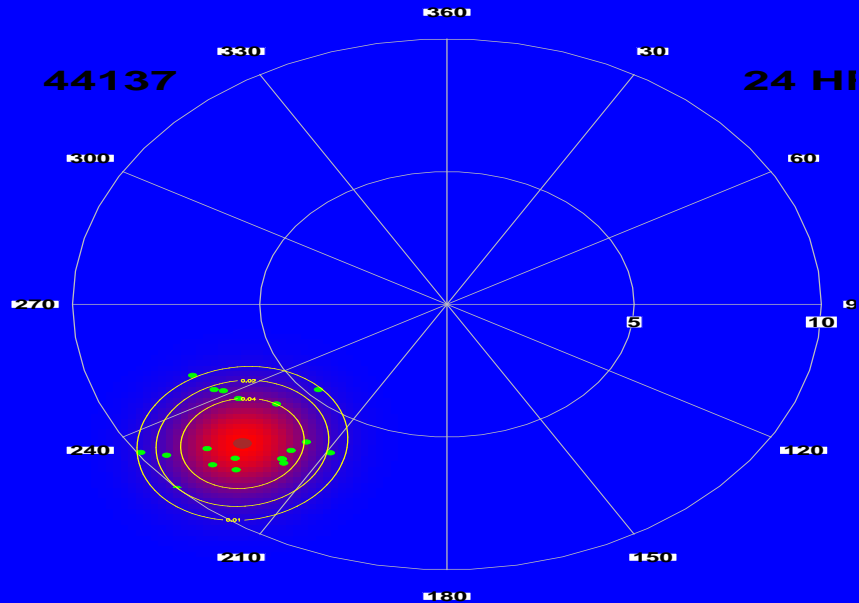
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$$P(WSPD = V \wedge WDIR = \theta)$$

- **bivariate Gaussian kernels**
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- **smoothing bandwidth as prescribed in Silverman's *Density Estimation***

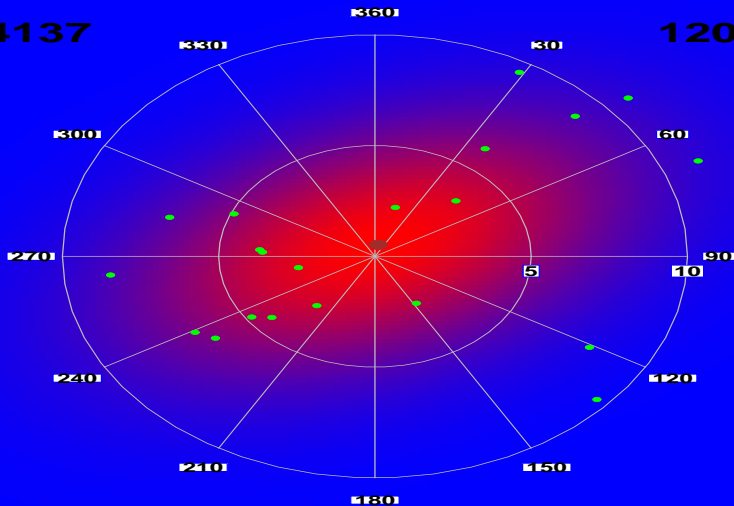
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24 HI



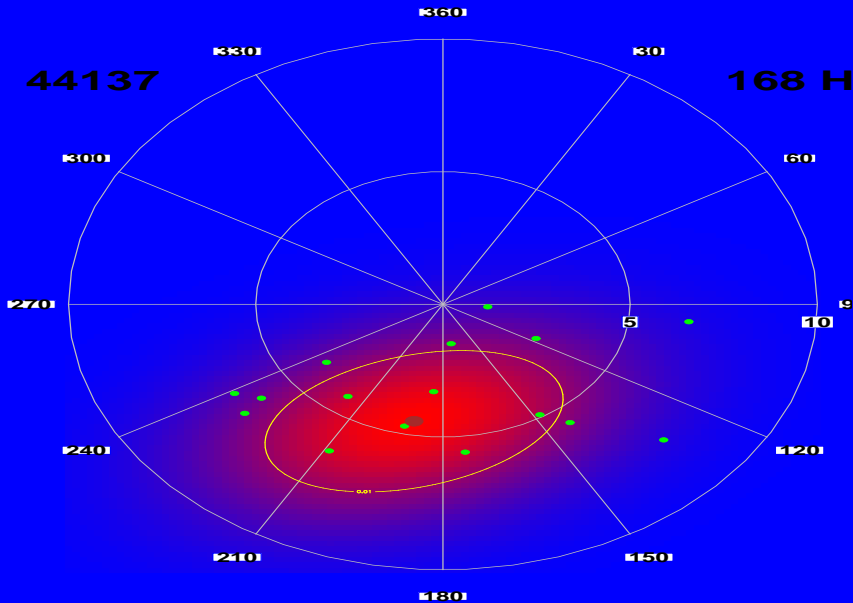
**44137**

**120 H**



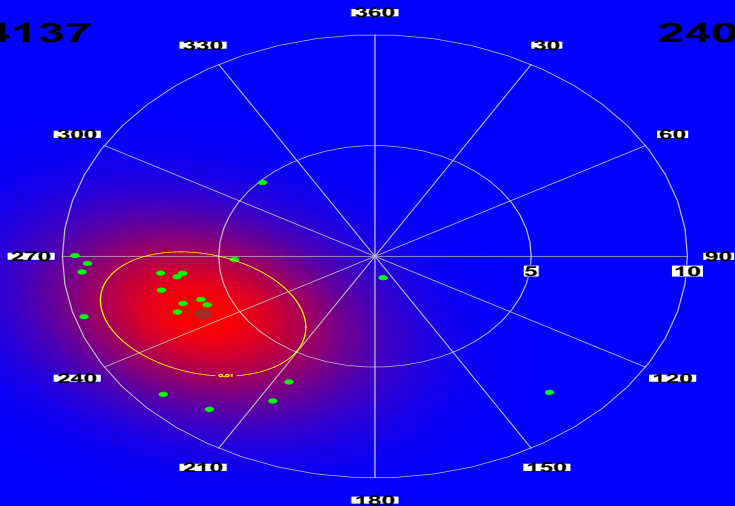
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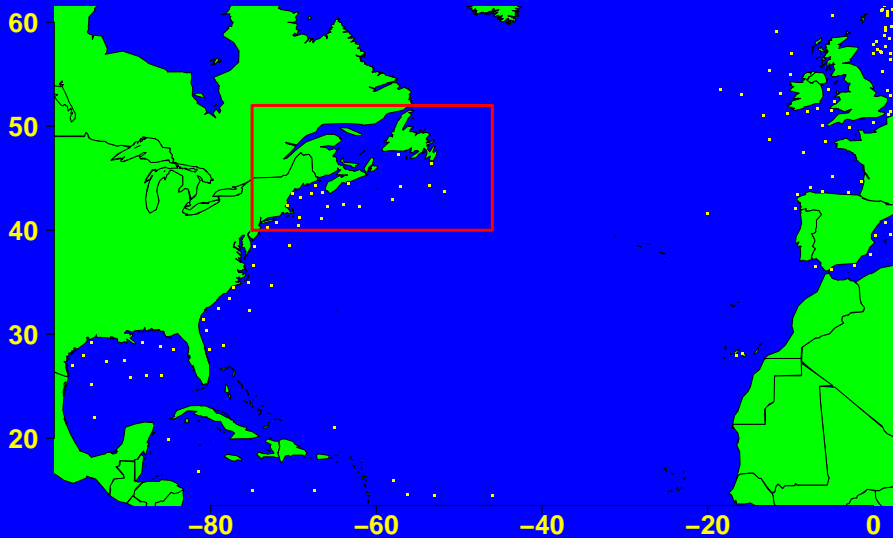
168 H

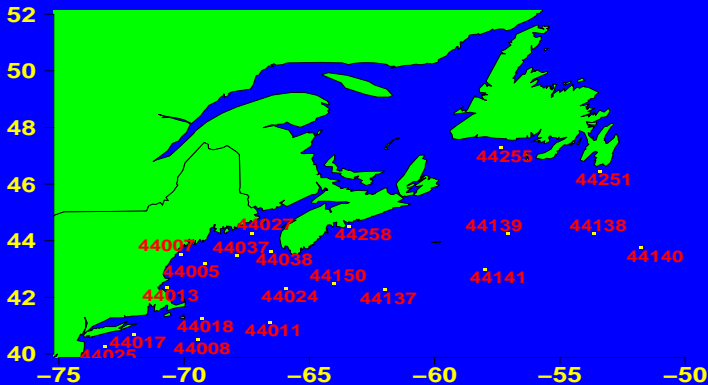


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240 H







# Verification Samples



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## Observational Data:

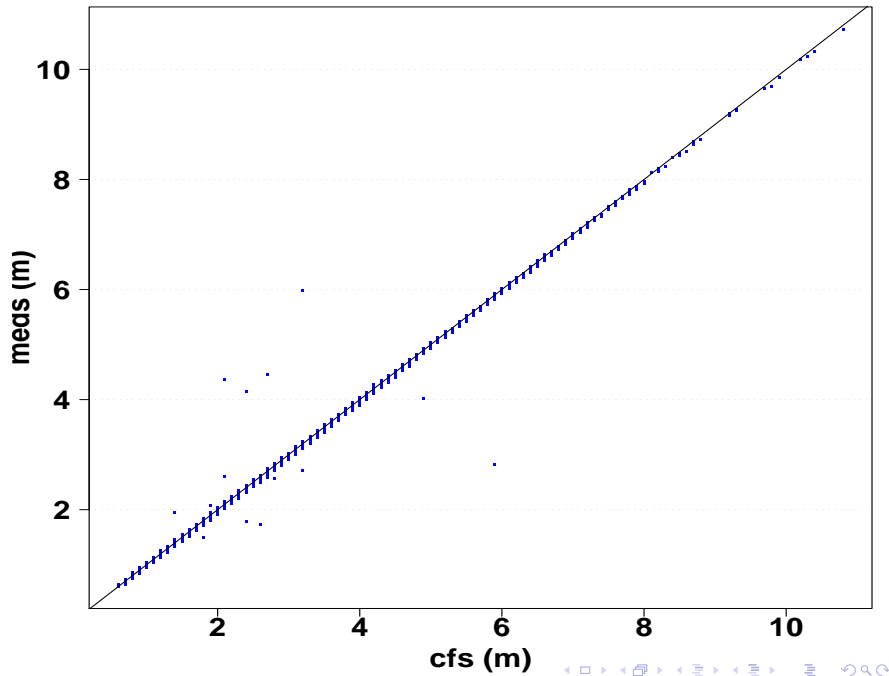
- buoy reports archived in binary on CFS archive/CMC

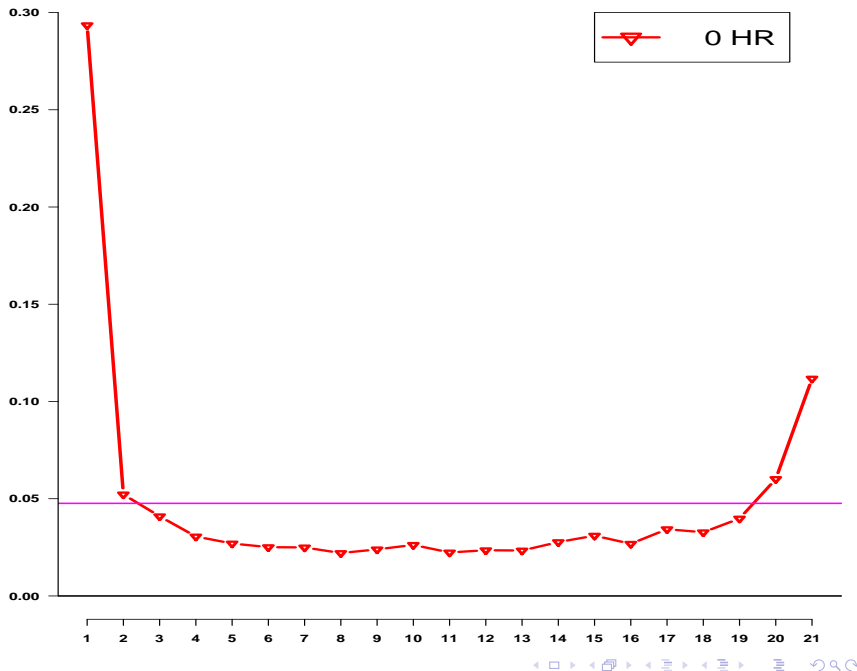
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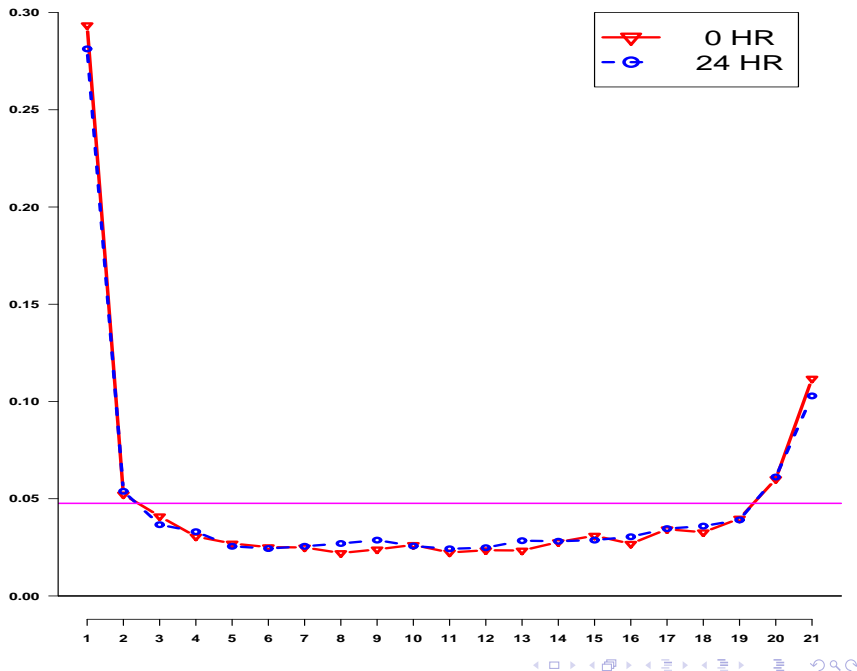


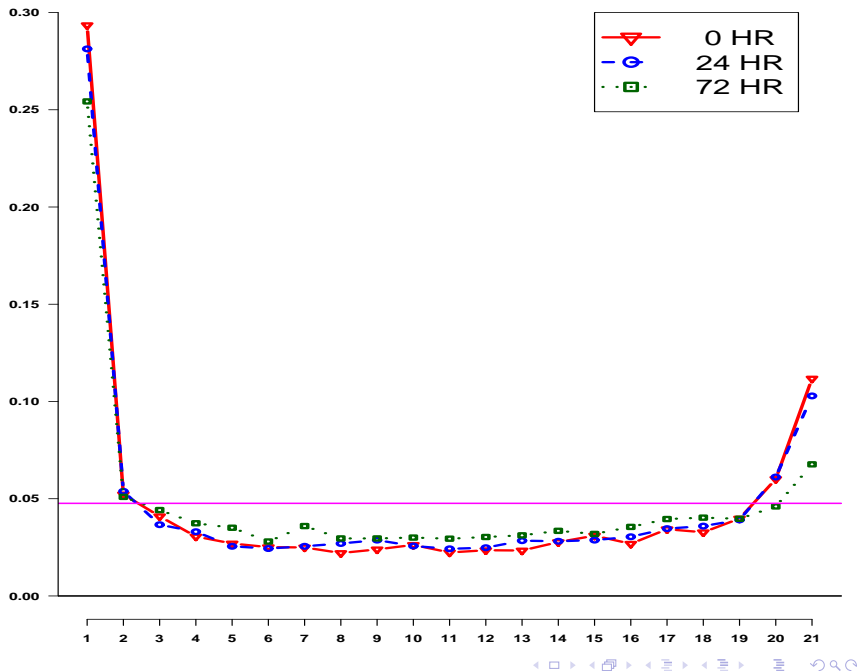
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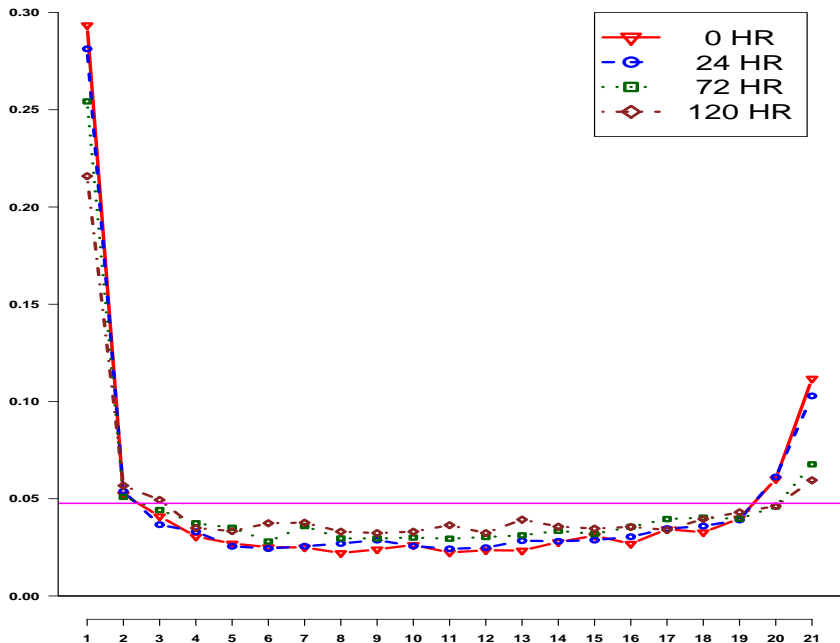
- buoy reports archived in binary on CFS archive/CMC
- as transmitted on GTS

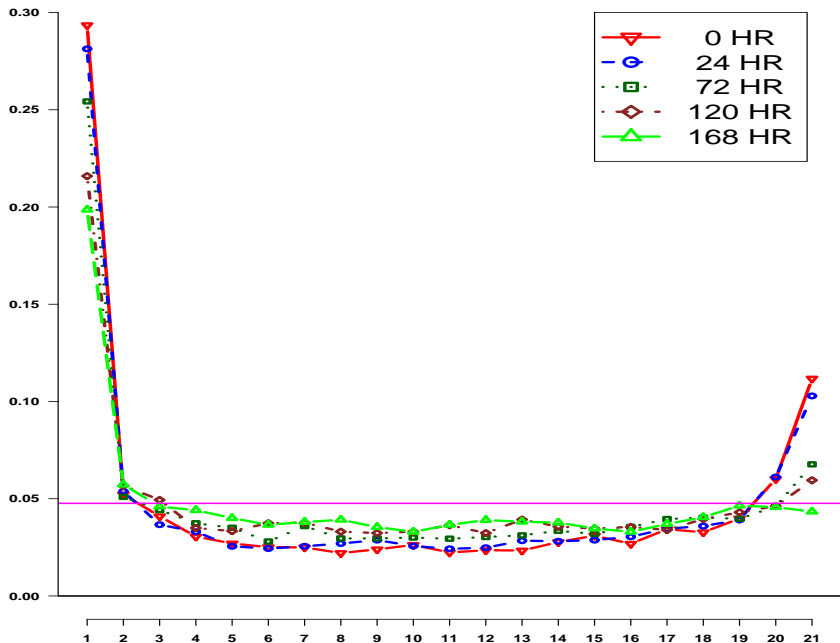


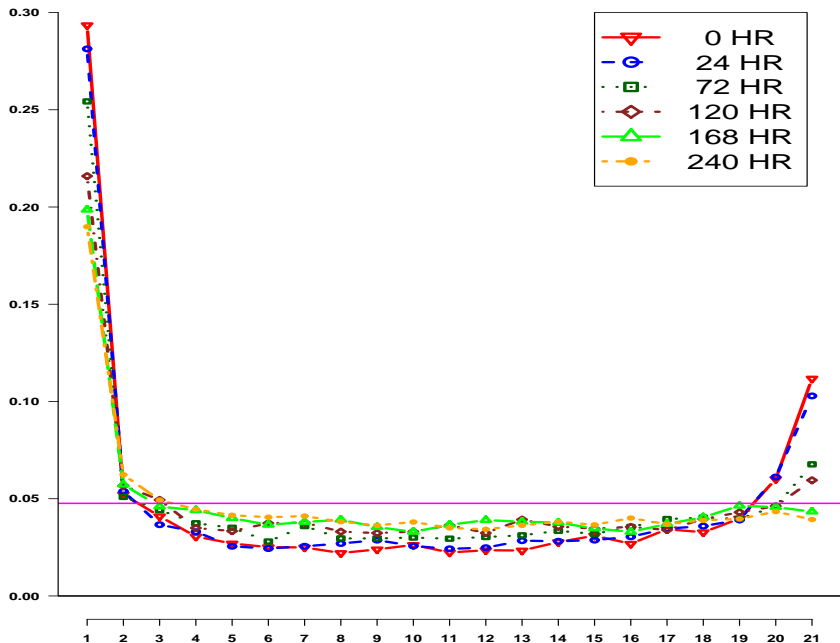


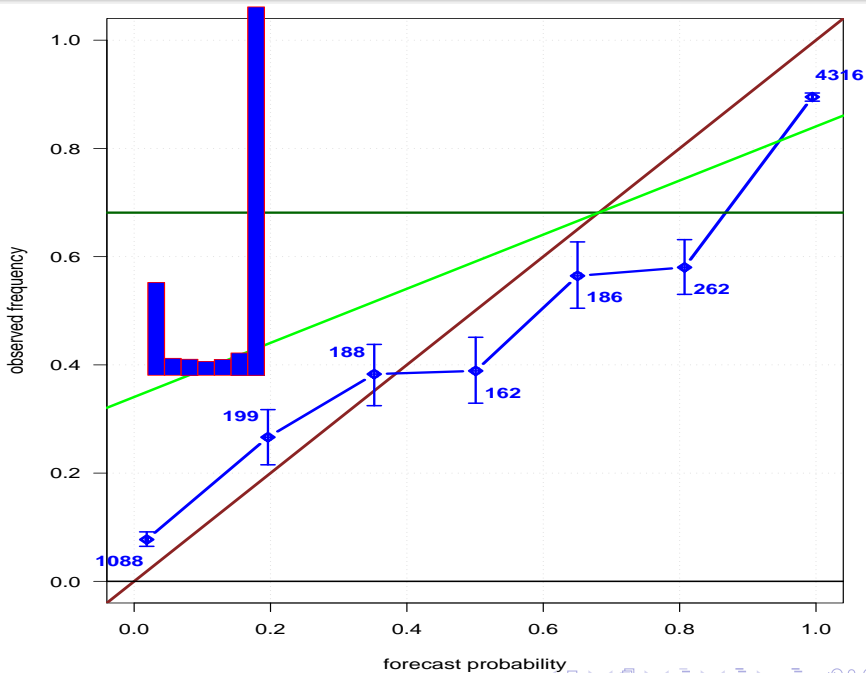


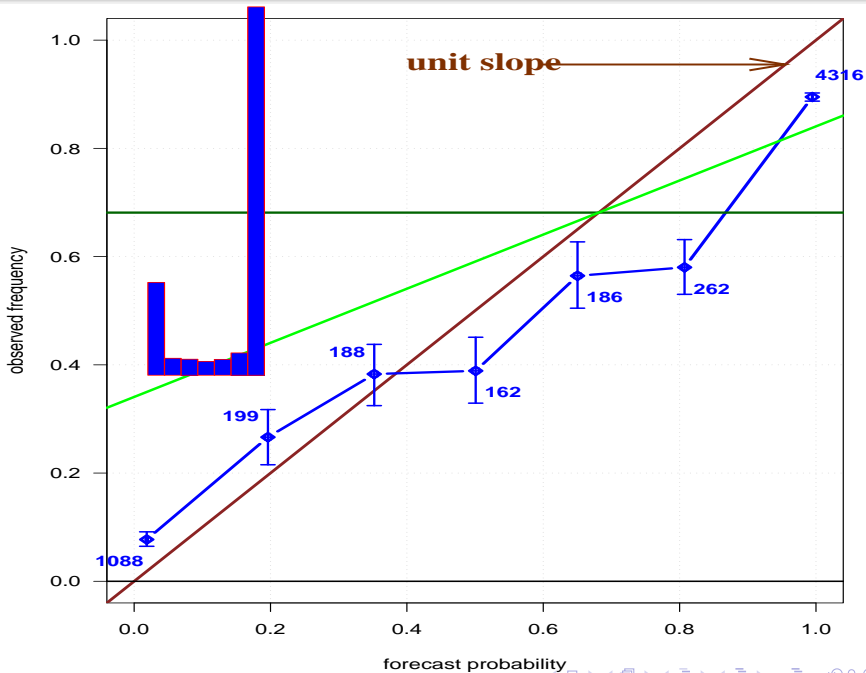


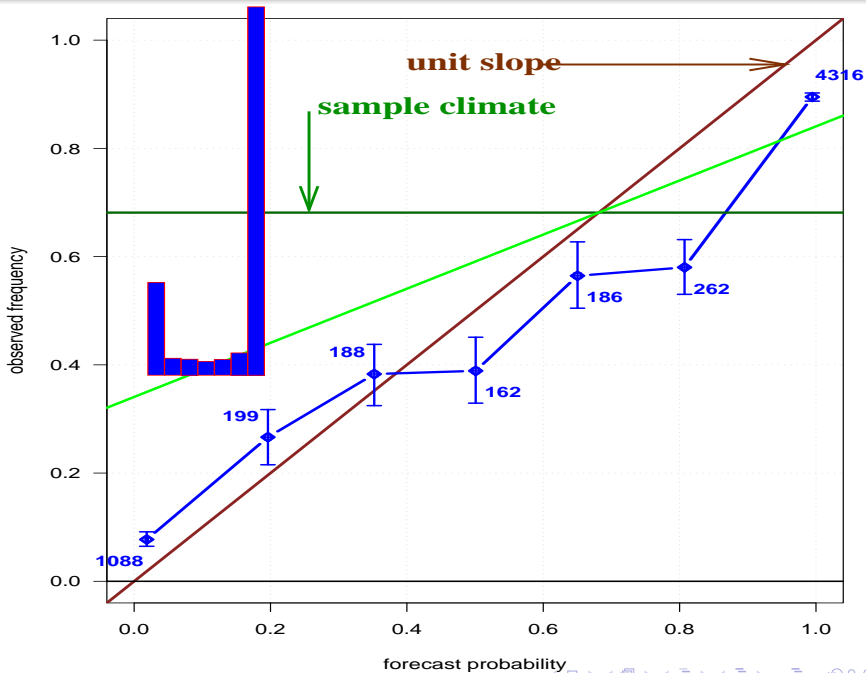


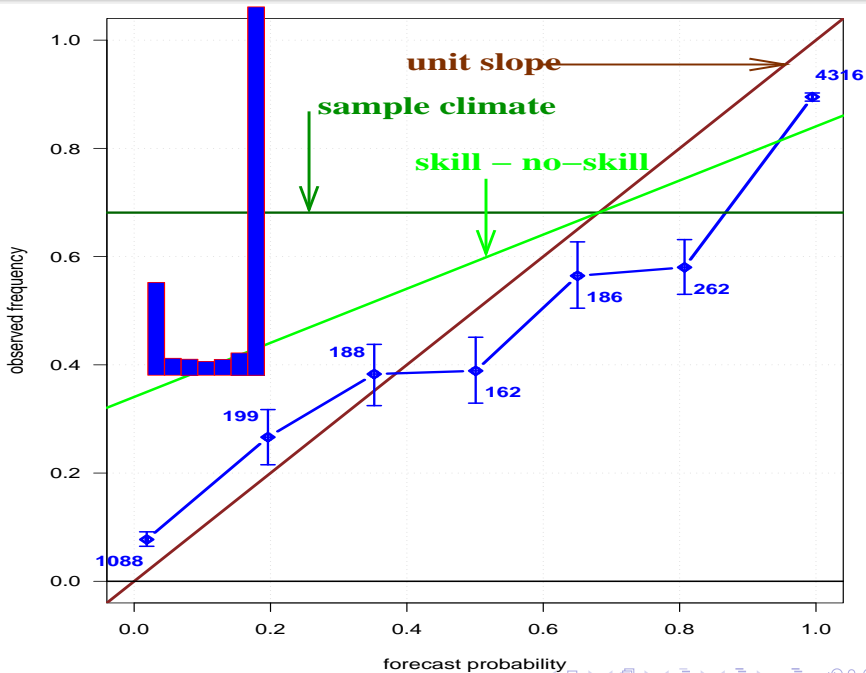


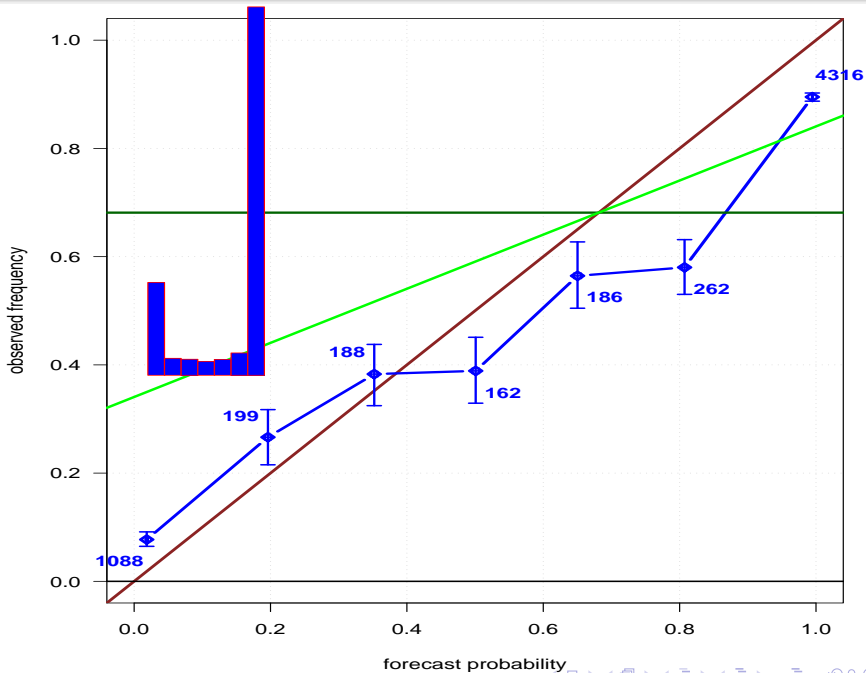


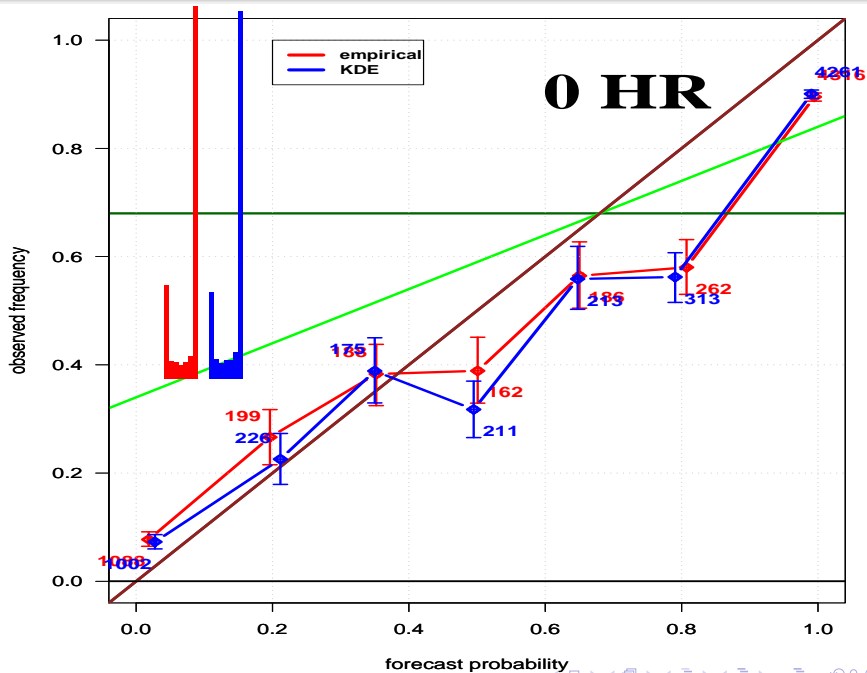


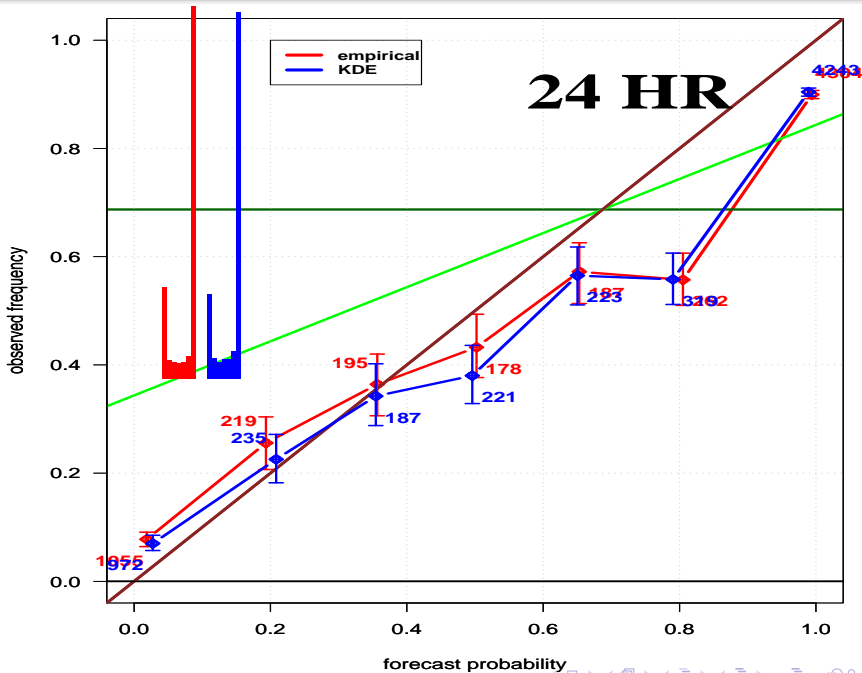


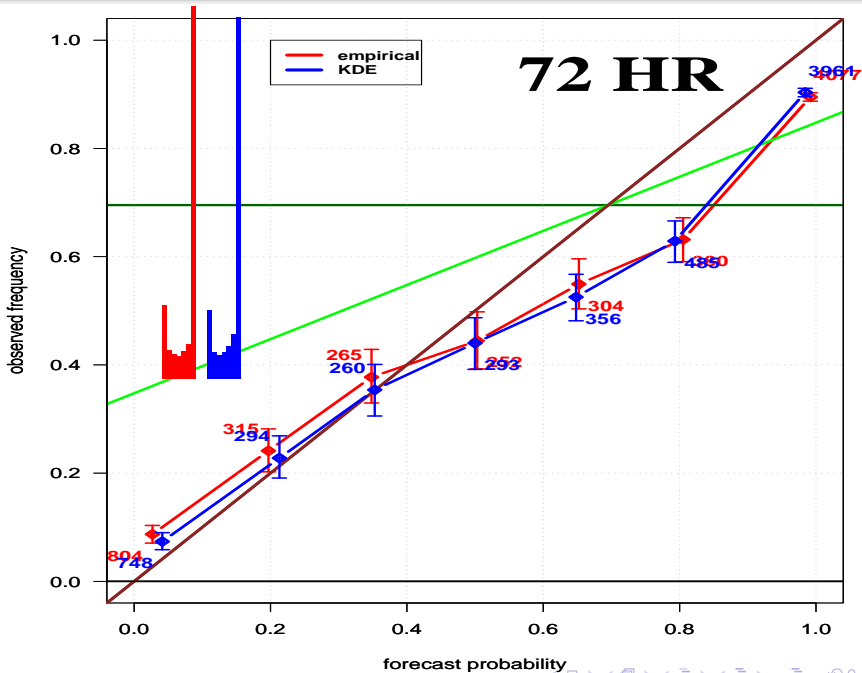


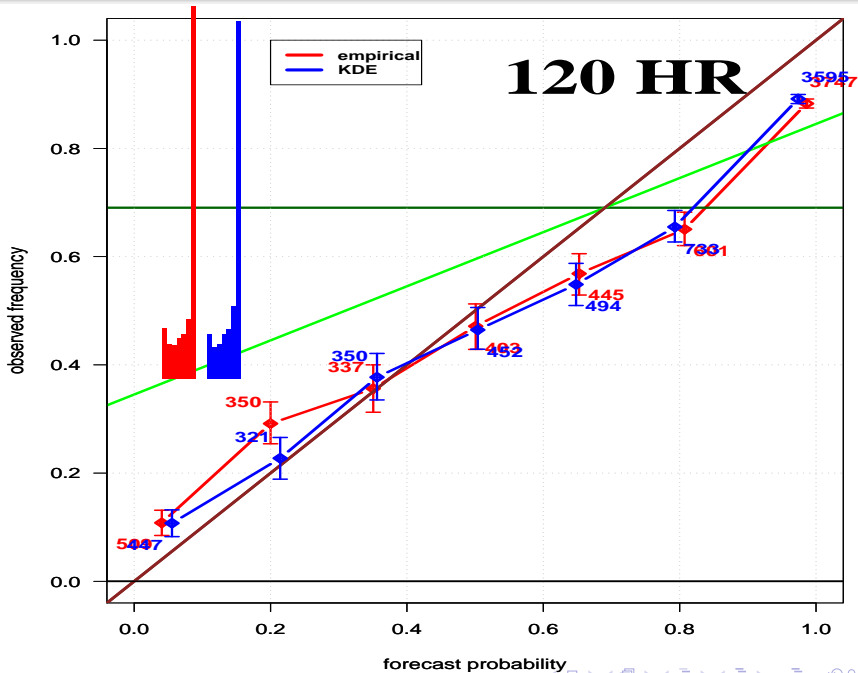


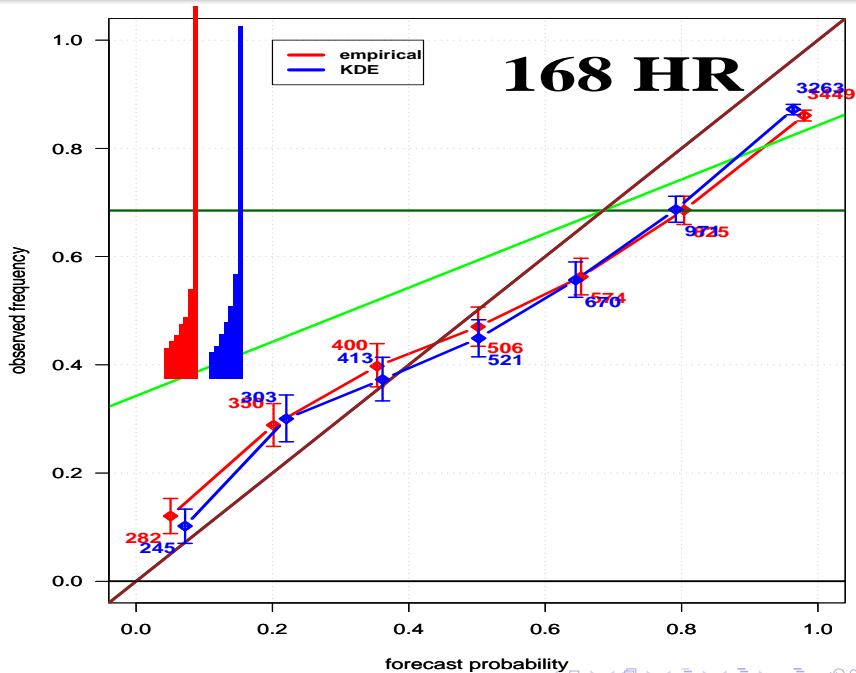


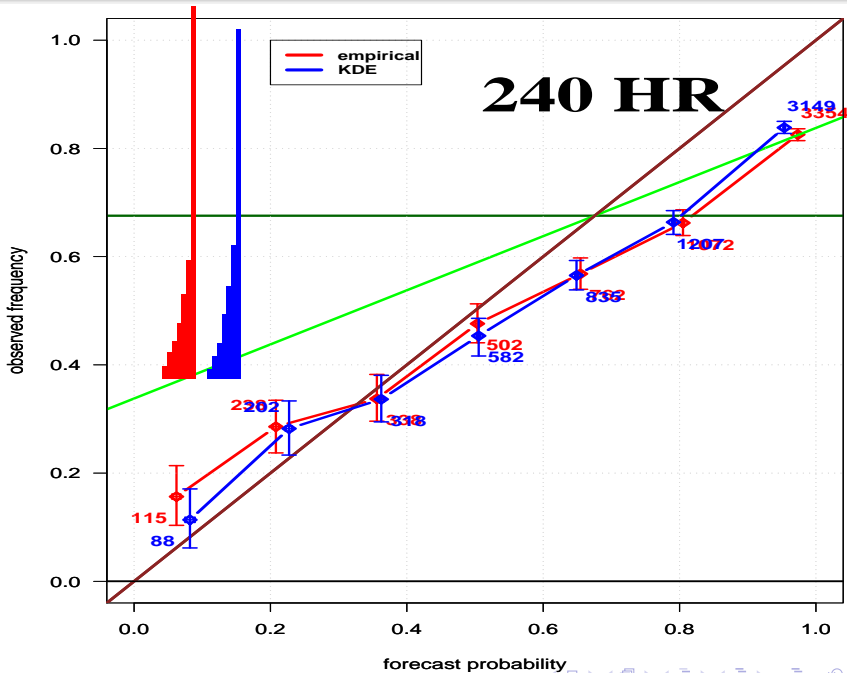






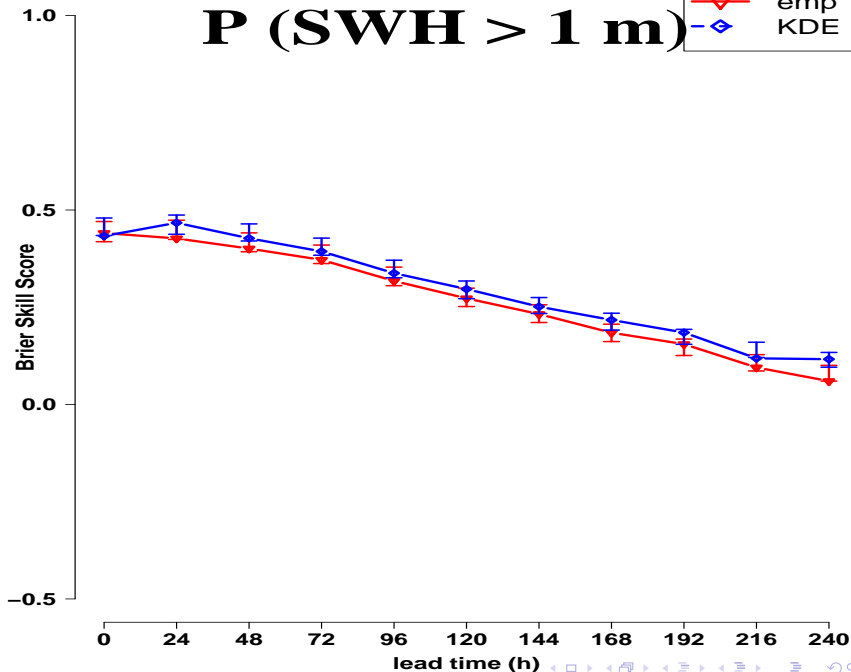


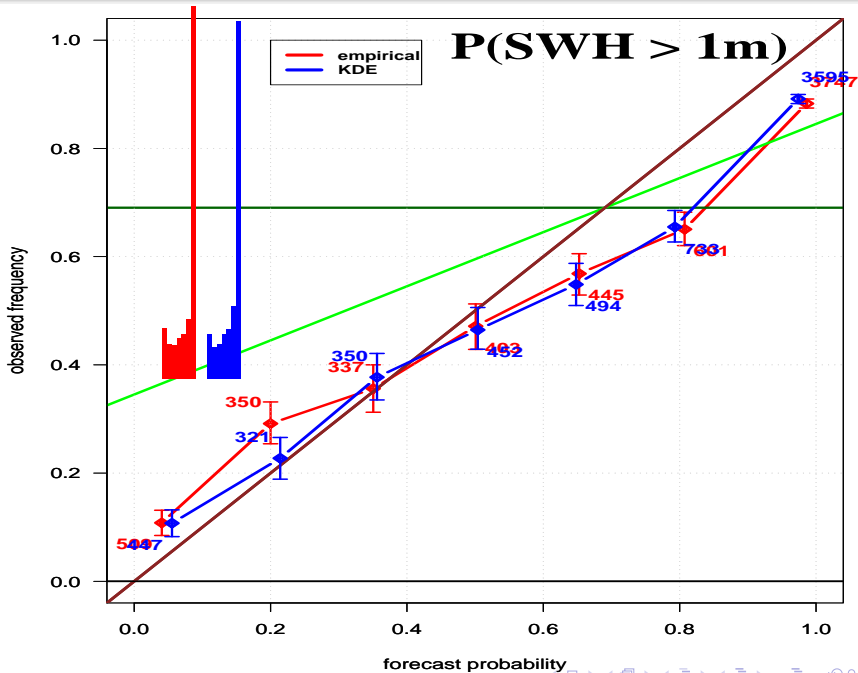


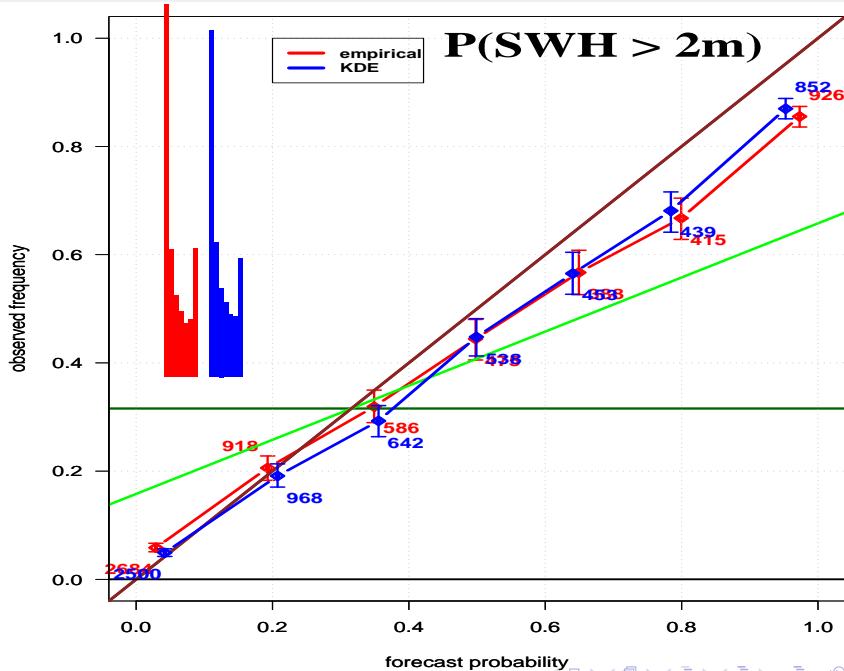


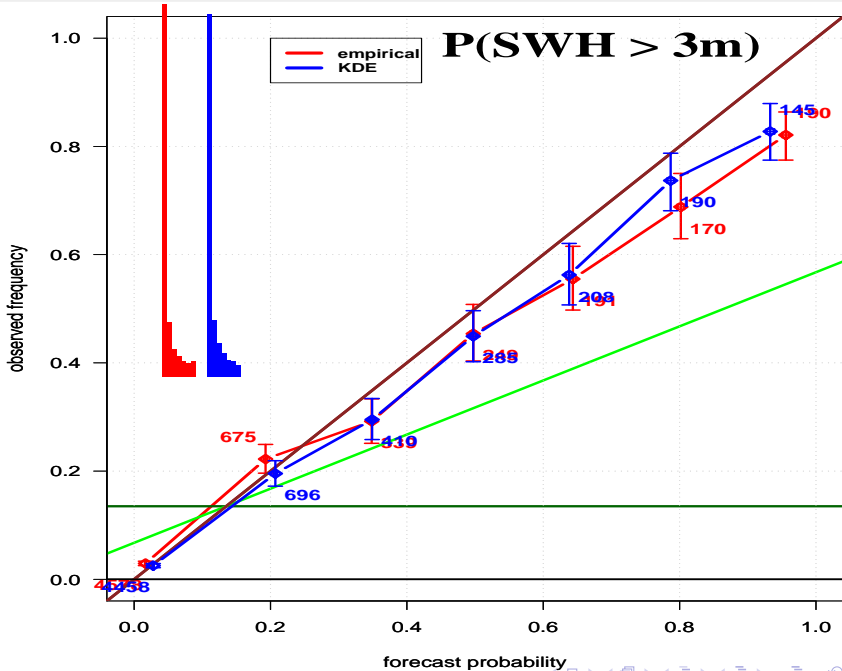
# P (SWH > 1 m)

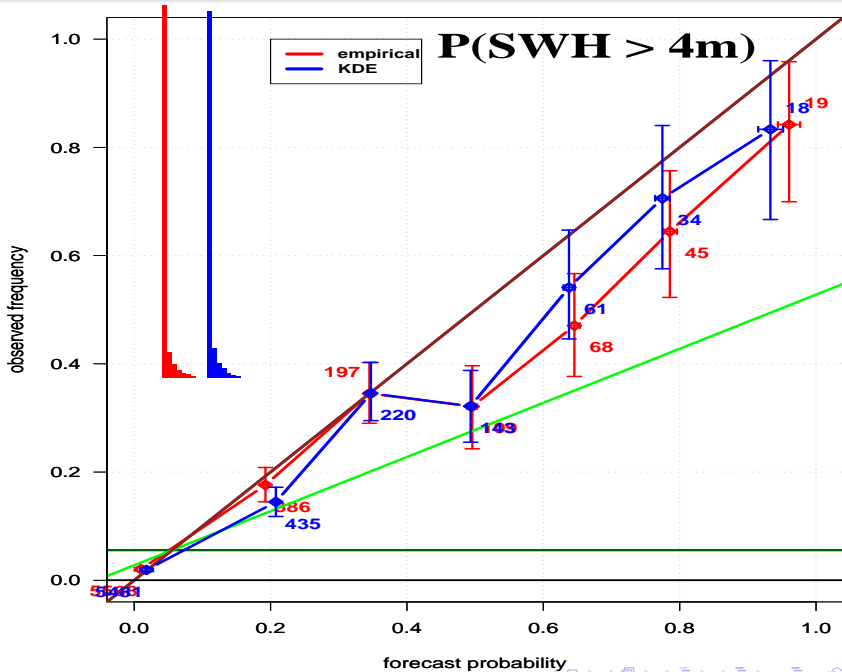
emp  
KDE

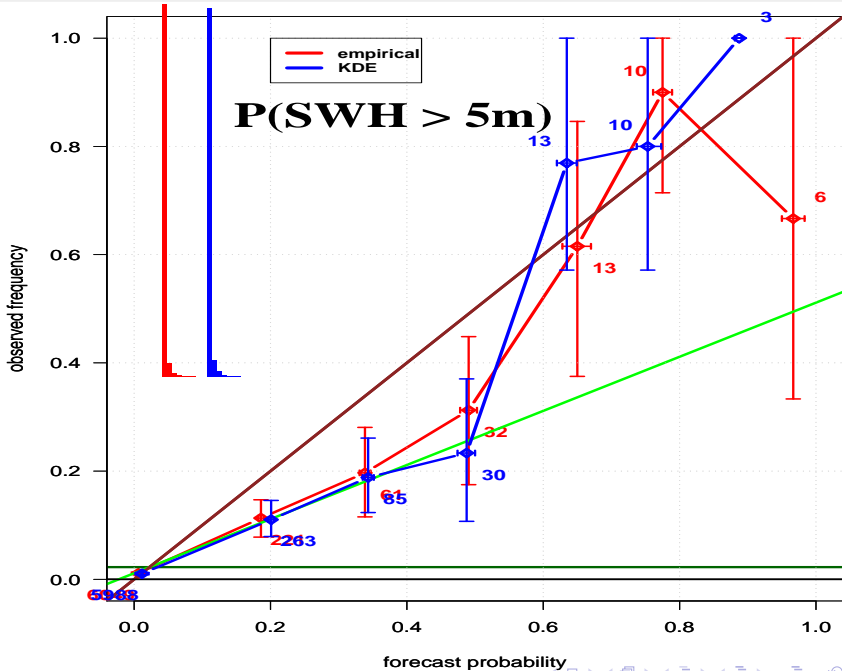


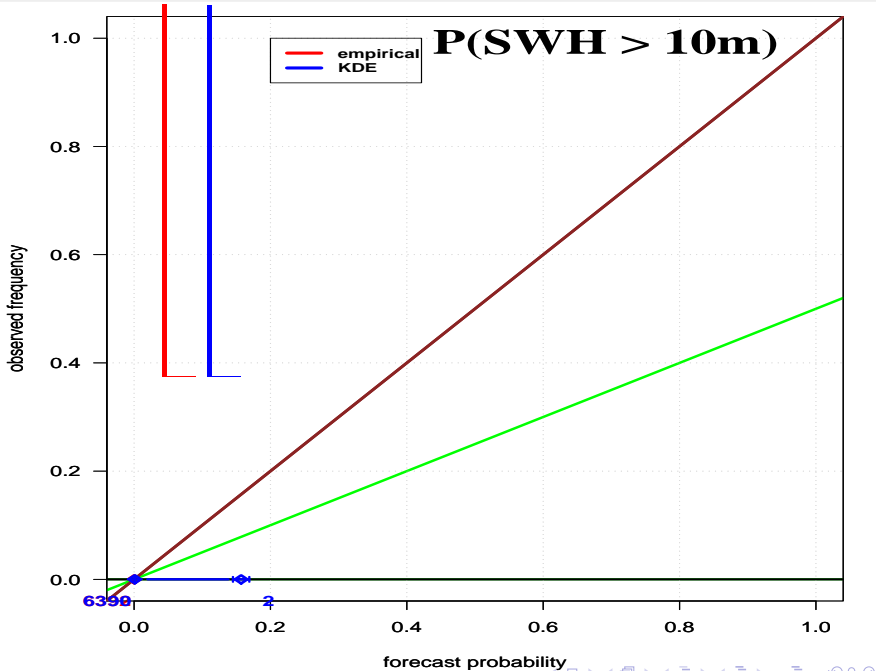












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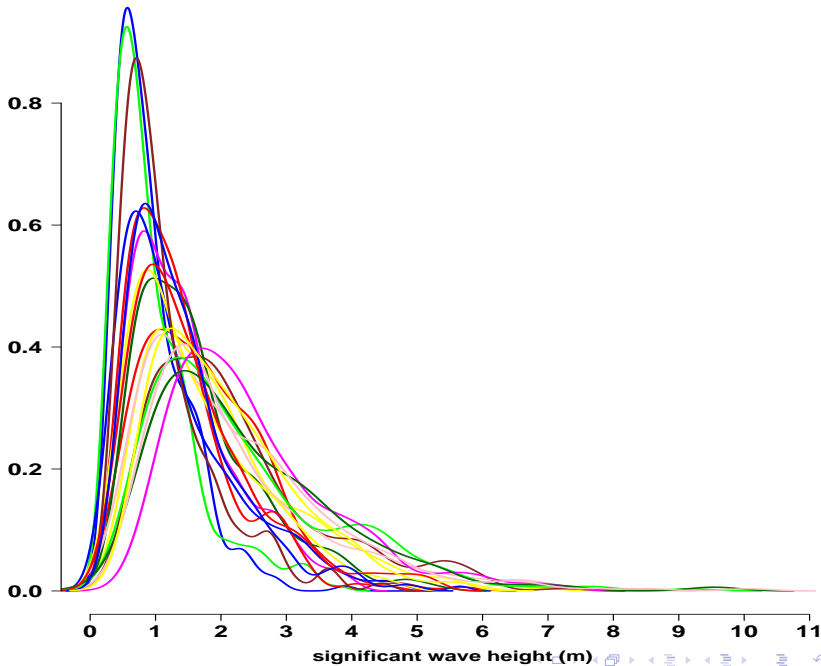
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## Acknowledgements

- **Canadian Search and Rescue NIF**
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- **Bridget Thomas**
- **Doug Mercer**
- **Jamie McLean**
- **Serge Desjardins**
- **Garry Pearson**