










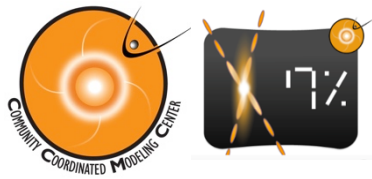
Flare Scoreboard

Currently registered models:

<p>AMOS <i>Automatic McIntosh Occurrence probability of Solar activity</i></p> 	<p>ASAP <i>Automatic Solar Activity Prediction</i></p> 	<p>ASSA <i>Automatic Solar Synoptic Analyser</i></p> 
<p>BoM <i>Data-driven probabilistic flare forecast model</i></p> 	<p>MAG4 <i>LOS and vector magnetogram forecasts</i></p> 	<p>Met Office <i>Issued Flare Forecast</i></p> 
<p>SolarMonitor.org <i>Flare Prediction System</i></p> 	<p>SIDC <i>Human operator moderated forecast</i></p> 	<p>UFCORIN <i>Universal Forecast Constructor by Optimized Regression of INputs</i></p> 

Planning group:

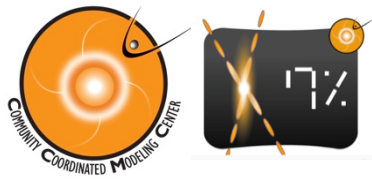
J. Andries (SIDC), S. Bloomfield (Northumbria), V. Delouille (SIDC), A. Devos (SIDC), J. Guerra (TCD), S. Hong (KSWC), M. Kuznetsova (NASA GSFC), K. D. Leka (NWRA), L. Mays (NASA GSFC), S. Murray (TCD), G. Steward (BoM), M. Terkildsen (BoM).



Flare Scoreboard

Model questionnaire example

1. Is the forecast human generated, model based, ...?
2. Does your flare prediction method forecast M1.0-9.9 or M and above?
3. How do you specify active regions in your model?
4. How far from disk center is your full disk forecast valid?
5. Does your model provide uncertainties for the forecasted probability?
 - If yes, what percentiles do you use to determine your upper and lower bound?
6. What prediction window(s) does your method use?
7. Do you have calibration for the probabilities from your model?
 - If yes, what is considered a low, medium, or high level?



Flare Scoreboard

Full-disk forecast submission example

#File name format: Flare_Forecast_modelname_yyyymmdd_hhmm.txt
Forecasting method: MAG 4
Time: 2015-11-25T12:00Z
Prediction Window Start Time: 2015-11-25T12:00Z
Prediction Window End Time: 2015-11-26T12:00Z
Probability Bins: M+
Input data: SDO/HMI LOS_Magnetogram
Prediction window (hours): 24

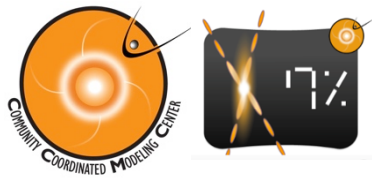
#Full Disk Forecast

#X_prob	X_uncert	X_Level	M_prob	M_uncert	M_Level	C_prob	C_uncert	C_Level
#0.4000	0.0800	3	0.6800	0.0500	3	0.7500	0.0500	3

*_prob: *Probability of X, M, or C class flare in decimal format (4 places)*

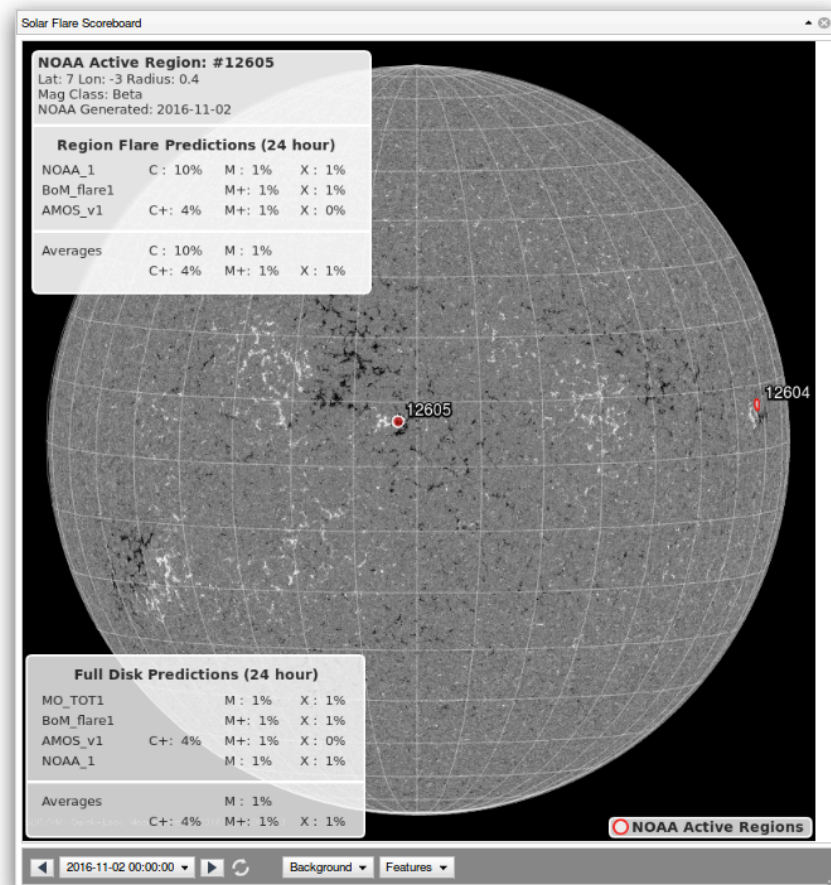
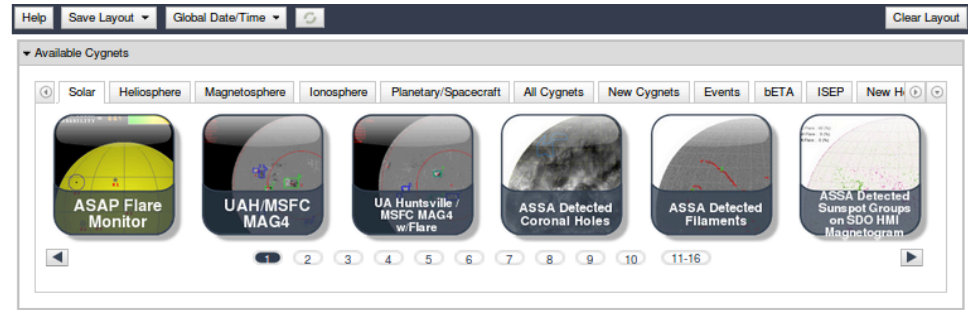
*_uncert: *Uncertainty in X, M, or C class flare probability in decimal format (4 places) (optional)*

*_level: *Calibration of probability for the model for X, M, or C class flares (1=low, 2=medium, 3=high)*

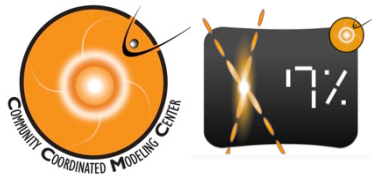


iSWA

Beta version
available on the
integrated space
weather analysis
system



<http://ccmc.gsfc.nasa.gov/challenges/flare.php>



Flare Scoreboard



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Real-time Forecasting Methods Validation: Flare Scoreboard

CCMC is in the implementation phase of the "Flare Scoreboard" together with Sophie Murray of the UK Met Office and the international research community. The flare scoreboard is an automated system such that model/method developers upload their predictions automatically uploaded to an **anonymous ftp** which will be parsed by the system. The forecasts are shown on an **interactive display** of SDO/AIA or HMI images, and will also be displayed together on a graph of probability vs. time.

Please email [Sophie Murray](#), [Masha Kuznetsova](#), and [Leila Mays](#) with your feedback which will be shared with the flare scoreboard planning group.

See the agenda of ESWW13 working meeting: [Community-wide space weather Scoreboards: Research assessment of real-time forecasting models and techniques.](#)

Flare scoreboard planning group:









Leads: Sophie Murray (TCD), Jesse Adries, Veronique Delouille (SIDC)

Mike Terkildsen, Graham Steward (Australia Bureau of Meteorology, Space Weather Services), K.D. Leka (NWRA), Jordan Guerra, Shaun Bloomfield (Northumbria University), Masha Kuznetsova, M. Leila Mays (CUA/GSFC)

Participating partners:



Currently registered models:

AMOS Automatic McIntosh-based Occurrence probability of Solar activity 	ASAP Automated Solar Activity Prediction 	ASSA Automatic Solar Synoptic Analyzer 
BoM Data-driven probabilistic flare forecast model 	MAG4 MAG4 LOS and Vector Magnetogram Forecasts (four products) 	Met Office Space Weather Forecast (full disk) and Sunspot Region Summary 
SIDC SIDC human operator moderated 	UFCORIN Universal Forecast Constructor by Optimized Regression of INputs 	

[Click here to view the beta Flare Scoreboard showing real-time full disk and region forecasts on iSWA](#)

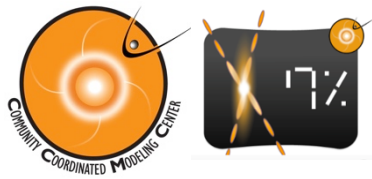
Tip: Use the arrows to step by 1 hr.

[Click here to learn how to download flare forecast files from the database using the iSWA API.](#)

[Flare Scoreboard Probability Timeseries Visualization Mock-up](#)

©2014 Flare Scoreboard

<http://ccmc.gsfc.nasa.gov/challenges/flare.php>



Validation

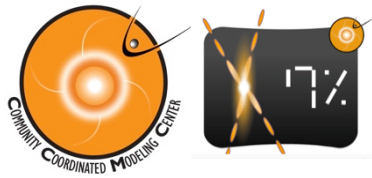
Convert probabilistic forecast to deterministic.

e.g., anything >25% is a 'yes' forecast..

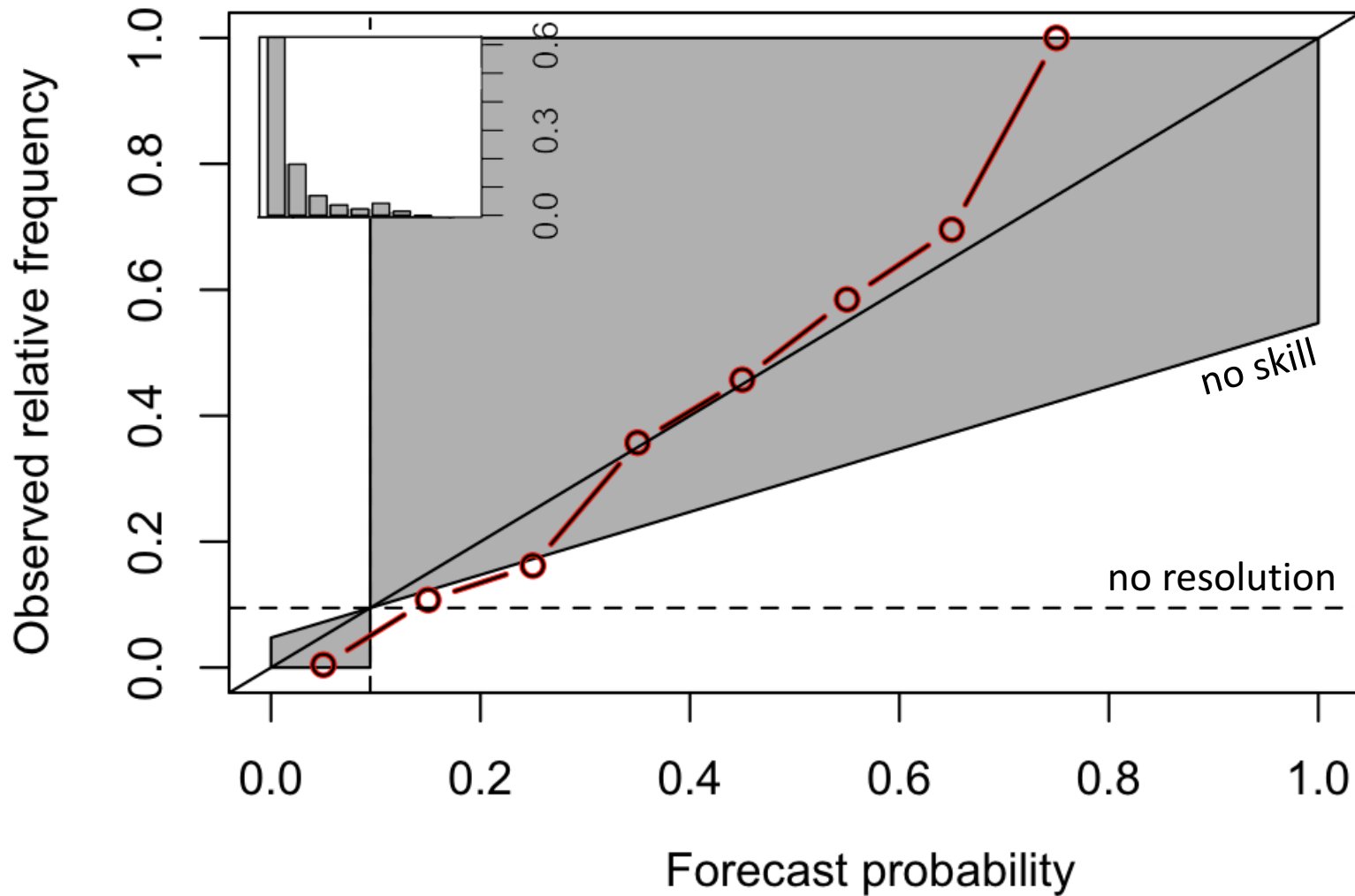
	Forecast flare	Forecast no flare
Observed flare	TP	FN
Observed no flare	FP	TN

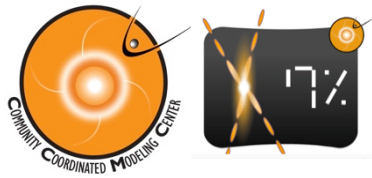
Metric Name	Short Name	Format	Worst Score	"No skill" Score	Perfect Score
Accuracy	ACC	$(TP + TN) / N$	0	...	1
Probability of detection	POD	$TP / (TP + FN)$	0	...	1
Probability of false detection (false alarm rate)	POFD	$FP / (FP + TN)$	1	...	0
False alarm ratio	FAR	$FP / (TP + FP)$	1	...	0
True skill statistic	TSS	$POD - POFD$	-1	0	1
Heidke skill score	HSS	$(TP + TN - E_{\text{random}}) / (N - E_{\text{random}})$	-1	0	1

where $N = TP + FN + FP + TN$

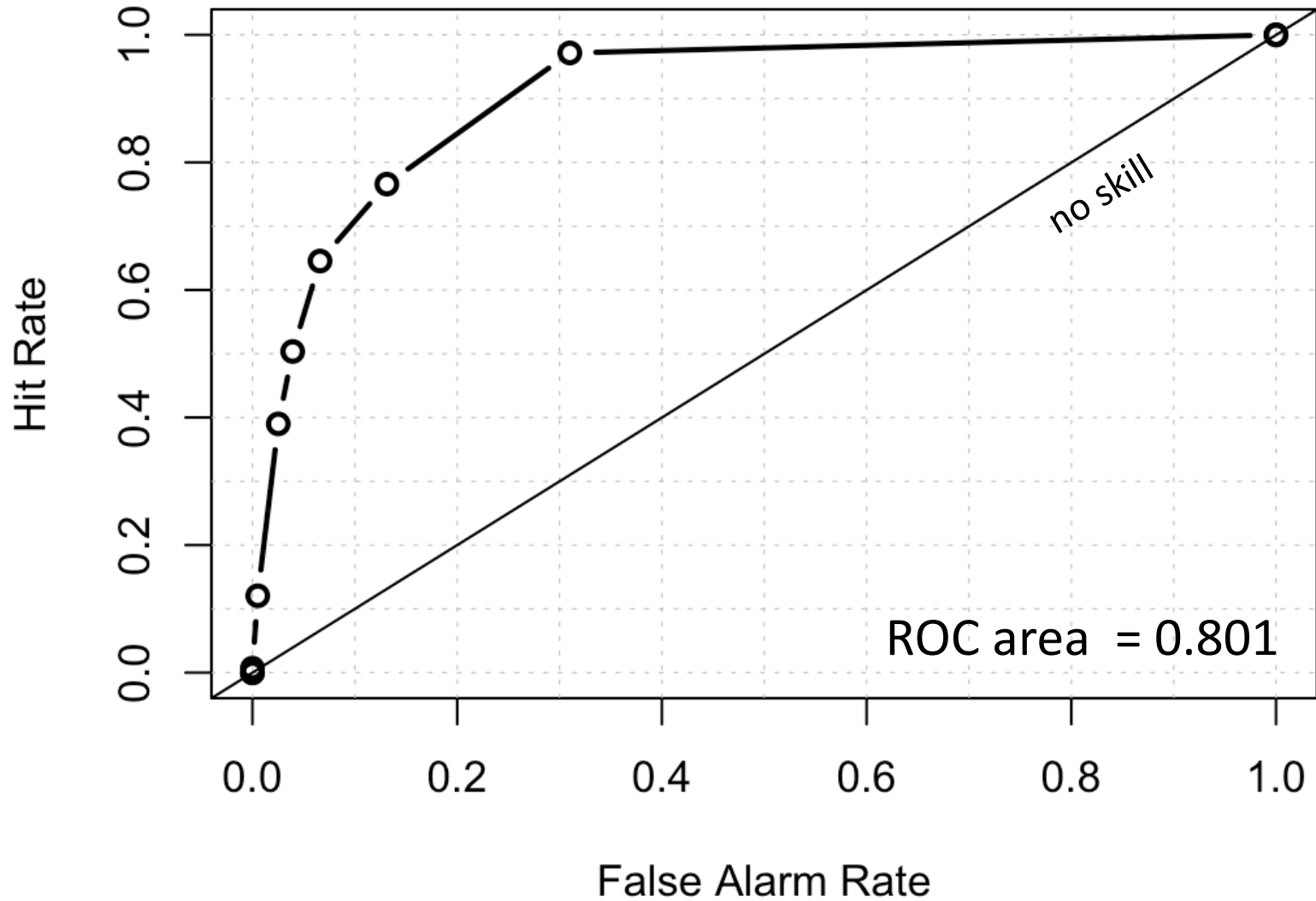


Validation





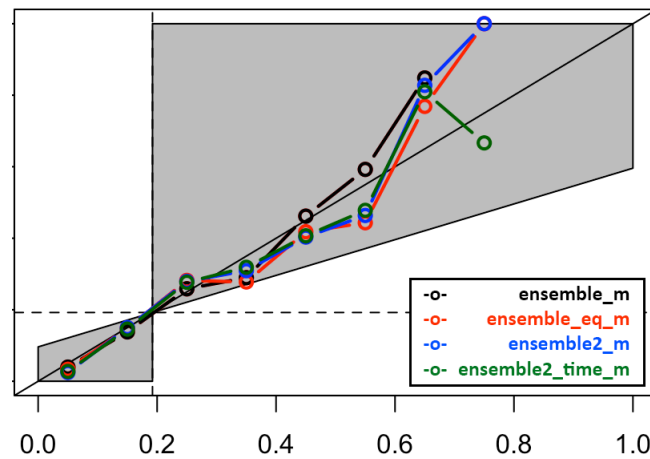
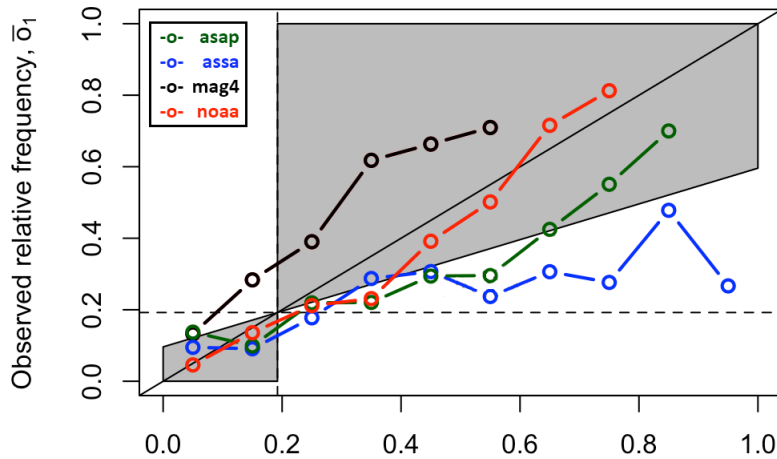
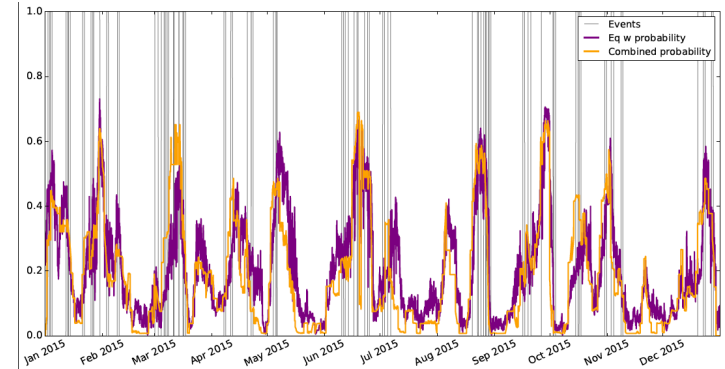
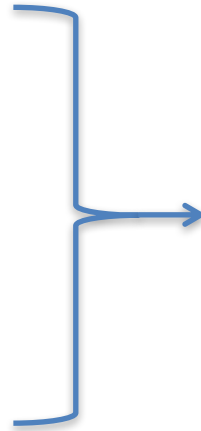
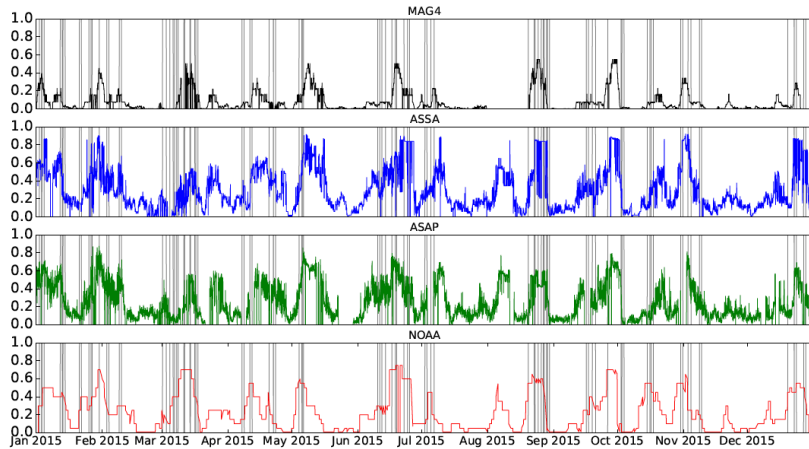
Validation



Ensemble Forecasting

Linear combination of probabilities

$$P^c(t; w) = \sum_{i=0}^N w_i P_i(t)$$



Forecaster
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