

A Consortium for COnvection-scale modelling  
Research and Development

**Practices of MQA - outcome of the 2021  
questionnaire**

Carl Fortelus, 6 April 2022, ASW Ljubljana/video-conference

# Scope of the survey

- operational suites:
  - deterministic forecasts and ensembles
  - domains, forecasts ranges
  - use of data assimilation
- forecast verification
  - data
  - metrics
  - software
  - reporting
  - use of verification results
- diagnostics of forecasting systems
- case studies
- user feedback

# Replies

- 18 institutes
  - replies and a summary are posted on the ACCORD MQA wiki
- 24 operational forecasting suites
  - 13 suites make use of upper air data assimilation (3D-VAR).
  - LAM-ensembles used operationally by 14 services
  - one rapid update cycling suite describes as operational

# Use of verification

- **identification of weaknesses and guidance for development**
- evaluation of new cycles
- *providing information to users or management is not often mentioned*

# Data

- **reporting weather stations**
  - **surface observations**
  - **balloon soundings**
- Met. reports (METAR) from airfields
- earth observation data from satellites and radars, crowd sourced observations & other sources

# Metrics, deterministic forecasts

## *Point metrics for deterministic forecasts*

	systematic & random error (1)	categorical verification (2)	correlation coeff.	answers
Surface	<b>12</b>	8	1	14
Upper air	<b>8</b>	2		11

1) mean bias, mean absolute error, rms-error, error standard deviation.

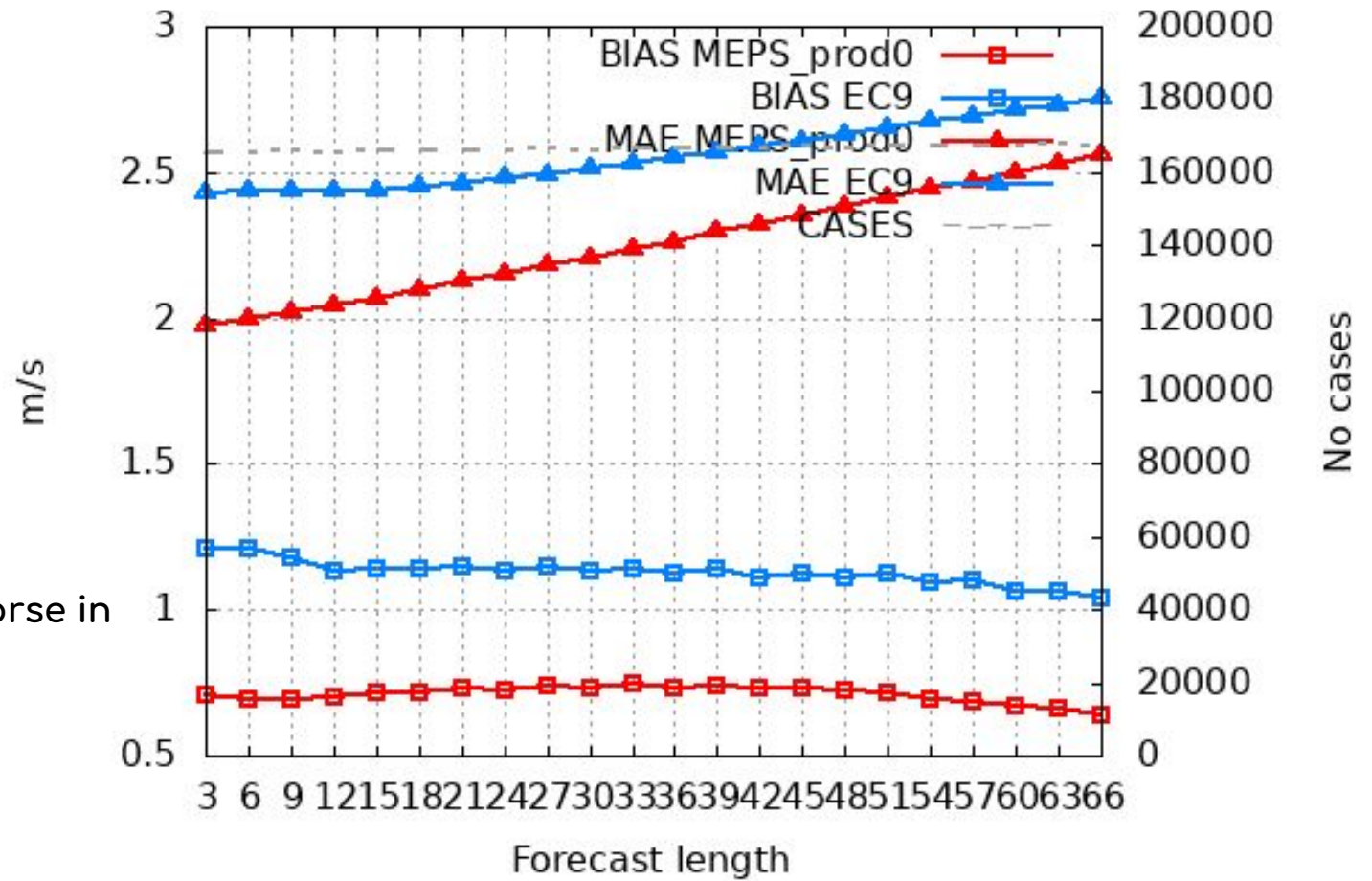
2) Hit rate, False alarm rate, POD, FAR, frequency bias, various scores and skill scores, etc

## *Spatial metrics for deterministic forecasts*

	FSS	SAL	SLX	SO-NF	field verif.	answers
surface (precipitation only)	3	4	1	1	3	11
Upper air	1				1	7

# Example: gusts in two systems

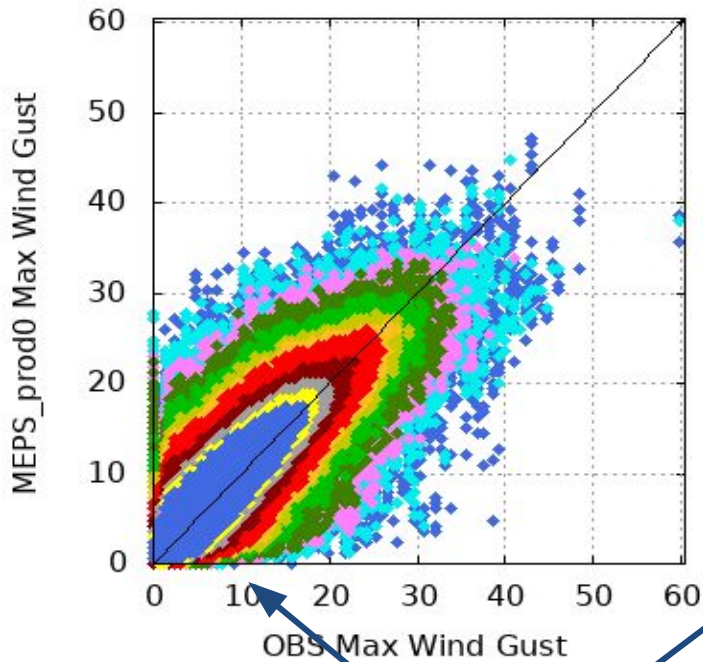
Selection: ALL using 574 stations  
Max Wind Gust Period: 202112-202202  
Hours: {00,06,12,18}



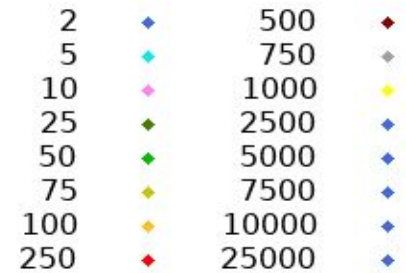
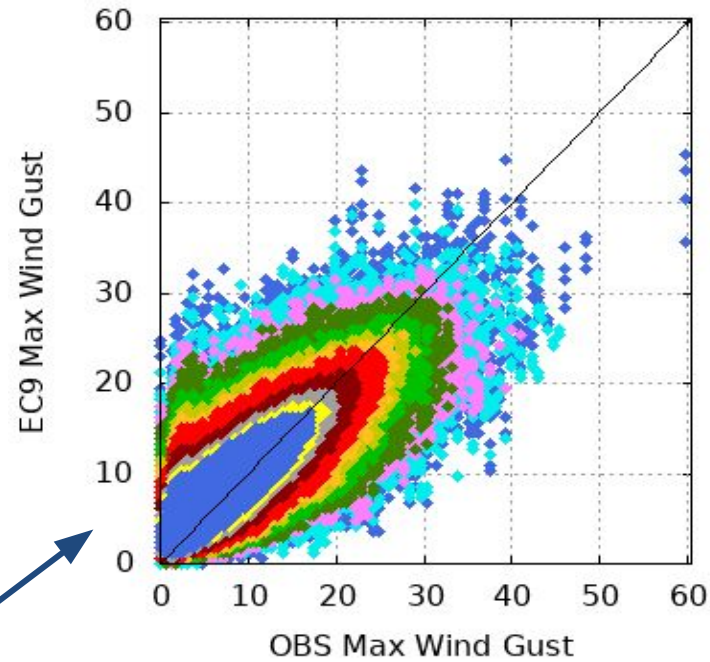
Positive bias, worse in model "EC9"

# Example: gusts

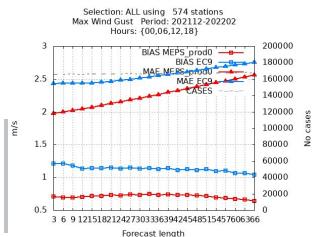
Scatterplot for 575 stations Selection: ALL  
Max Wind Gust [m/s]  
Period: 202112-202202  
Used {00,06,12,18} + 12 15 ... 36



Scatterplot for 575 stations Selection: ALL  
Max Wind Gust [m/s]  
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Used {00,06,12,18} + 12 15 ... 36



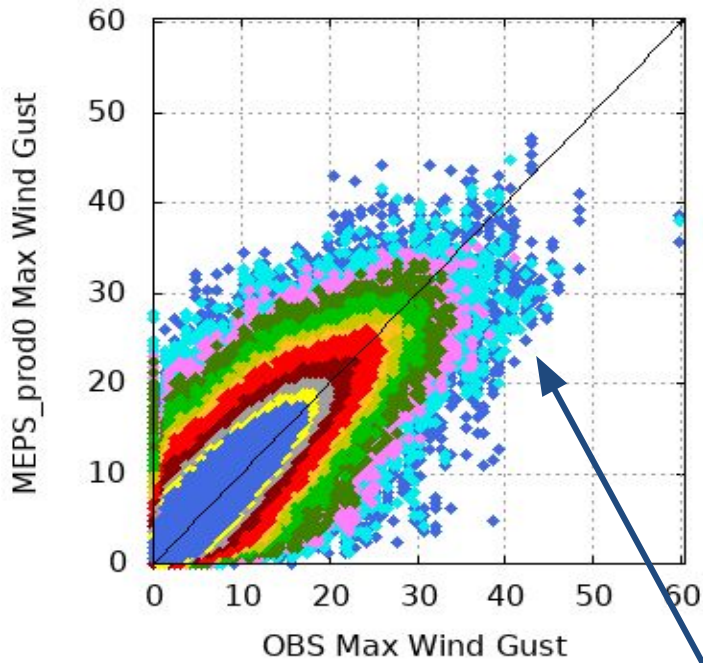
bias mainly from weak gusts



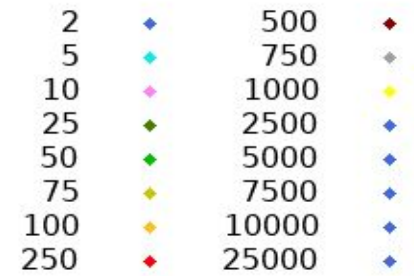
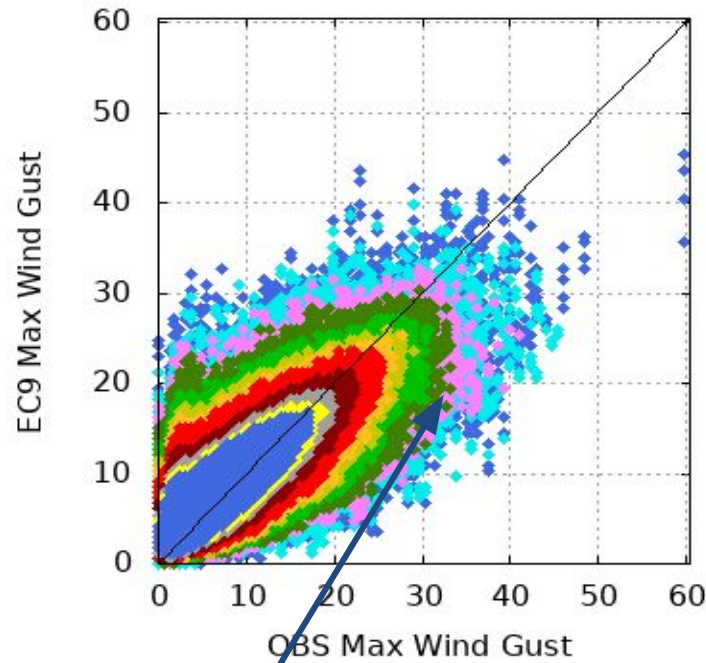


# Example: gusts

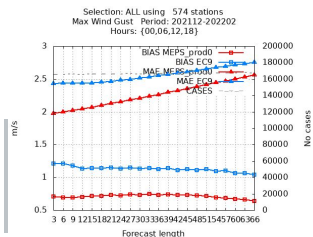
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strongest gusts underforecasted



# Metrics, ensemble forecasts

## *Point metrics for ensemble forecasts*

	spread-skill	mean bias	probabilistic scores	answers
surface	6	3	6	8
upper air	6	1	5	7

Probabilistic point measures: CRPS, Rank histogram, Brier score/skillscore, ROC, reliability-scores, etc.

## *Spatial metrics for ensemble forecasts*

	CRPS, measures of hits and false alarms with upscaling	CRPS, bias, stdv with upscaling	answers
surface	1		5
upper air		1	3

Probabilistic spatial measures: CRPS, HR,FAR with up scaling

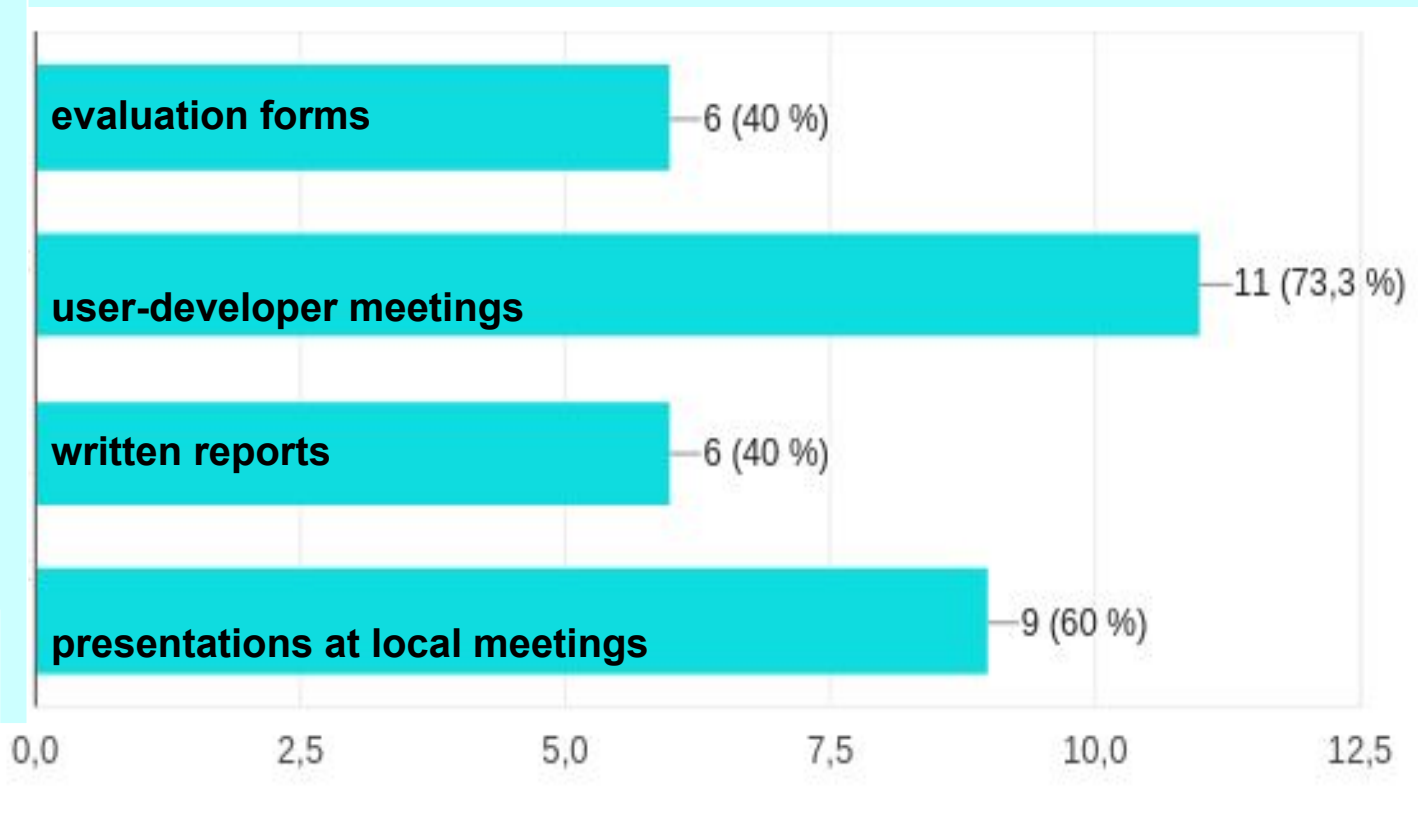
# Software

Type of fcst (answers)	harp	Monitor/webgraf	LAEF verif.	WFRT/verif	screening (ob-fg)	local develop m.	none
sfc det. (15)	6	7	1	2		6	
u/a det. (13)	4	8	1		1	2	2
sfc ens. (7)	2		1	1		1	2
u/a ens. (7)	2		1			1	3

# Reporting

- regular verification reports common
- typically monthly and seasonal summaries
- **access typically restricted** to institute or syndicate

# Collecting and reporting user feedback



# Outcome; scope for cooperation in ACCORD

- facilitate the use of more observations and methods
  - satellites, radars, citizen networks
  - high resolution analyses
  - spatial methods
- **common verification software**
- organize interaction with user communities

