Royal Netherlands
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Wind measurements from moving platforms and their impact on data assimilation

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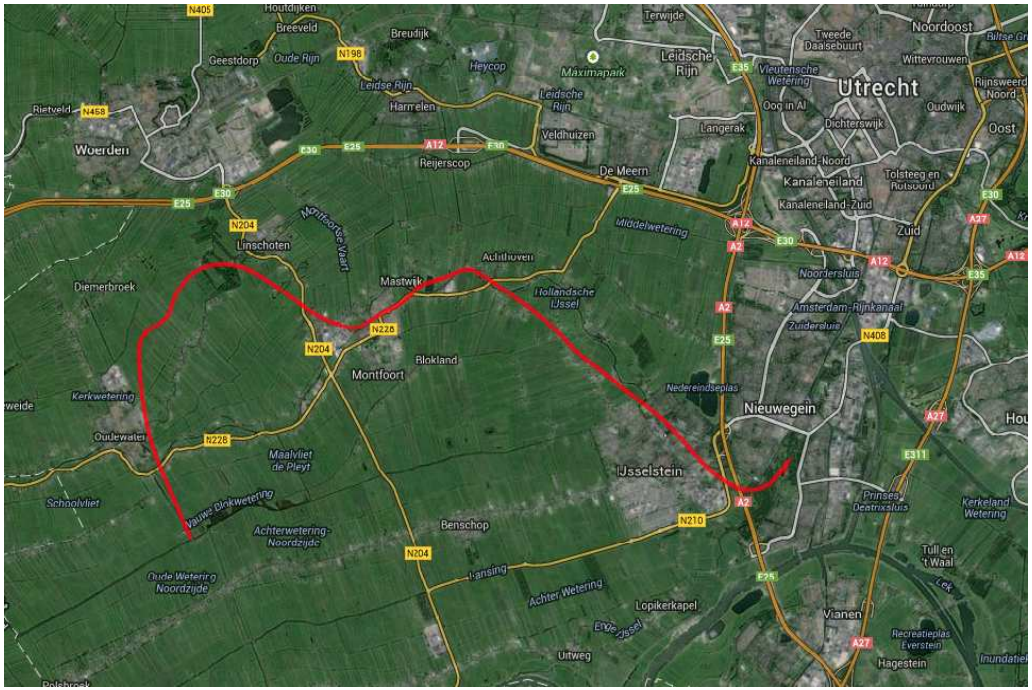
Motivation

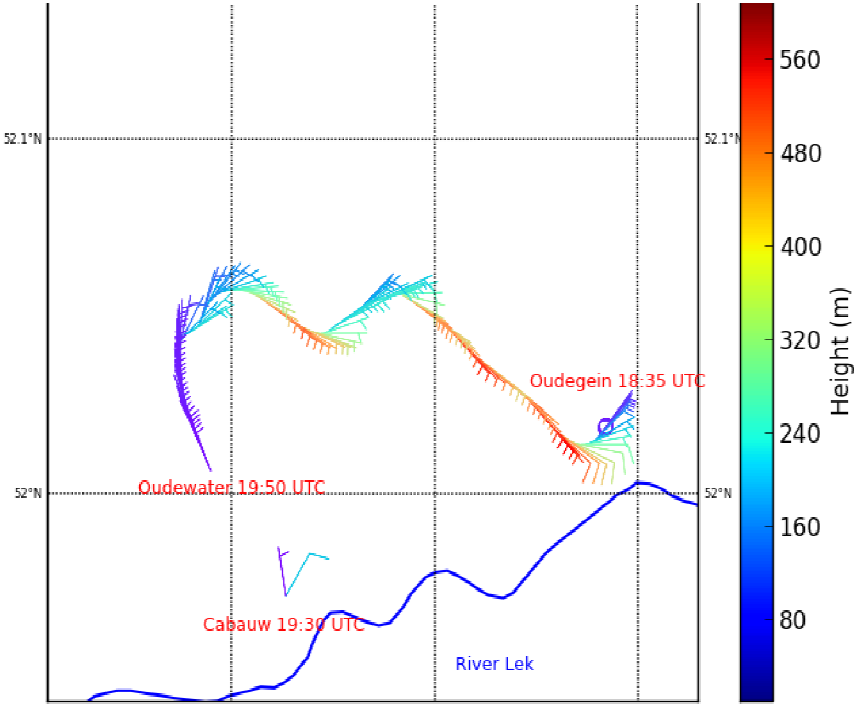
Goals:

1)Improve HARMONIE with new upper air observations

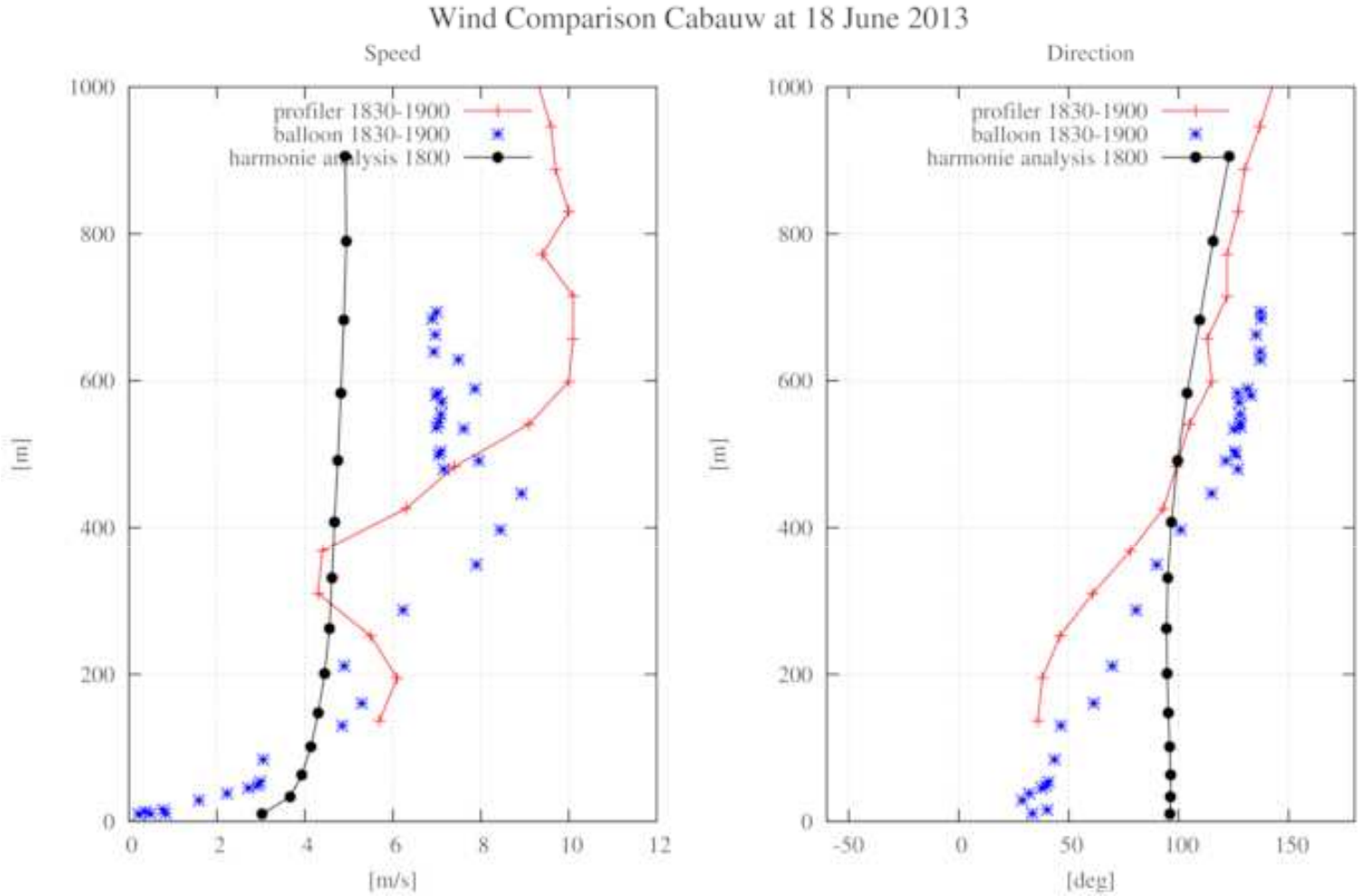
2)Obtain extra wind information of the ABL for validation and process studies

Hot-Air balloon flight 18 June 2013
Incoming sea breeze

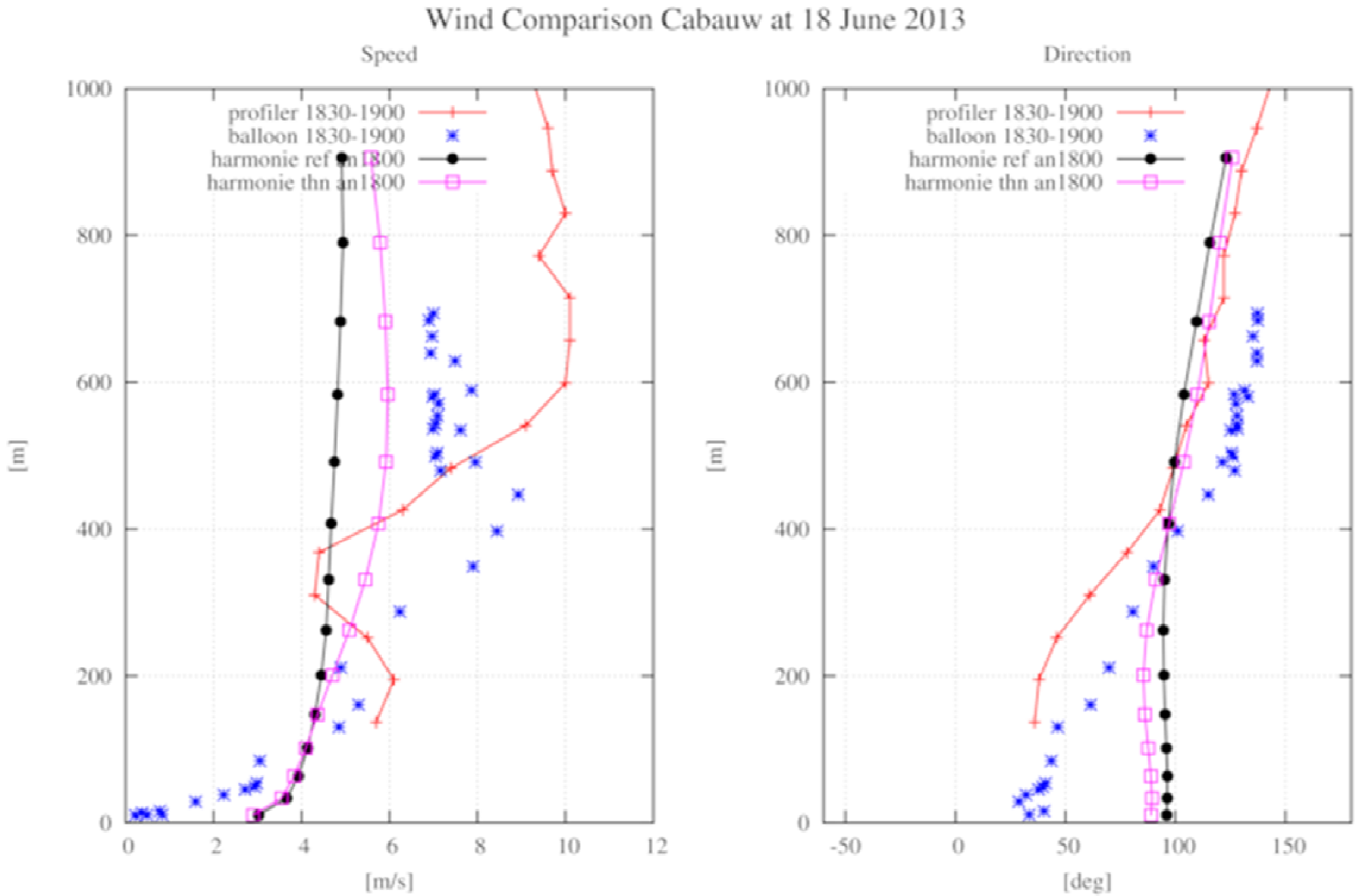




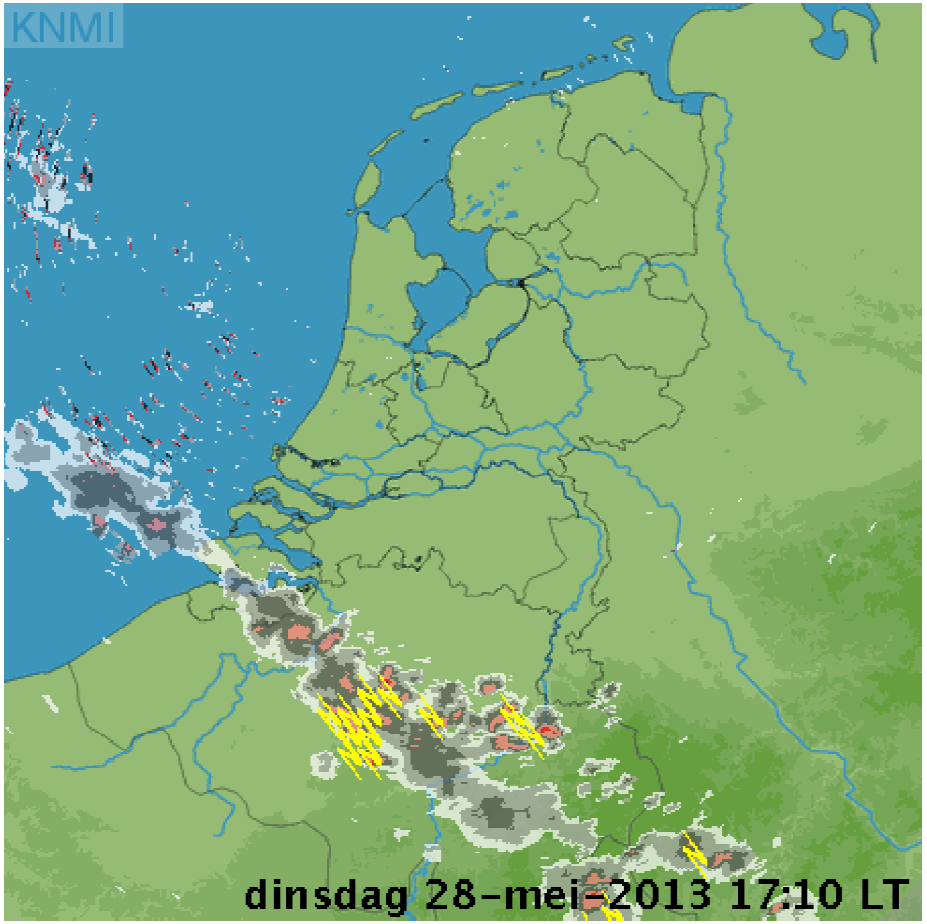
WindProfiler/Balloon/HARMONIE

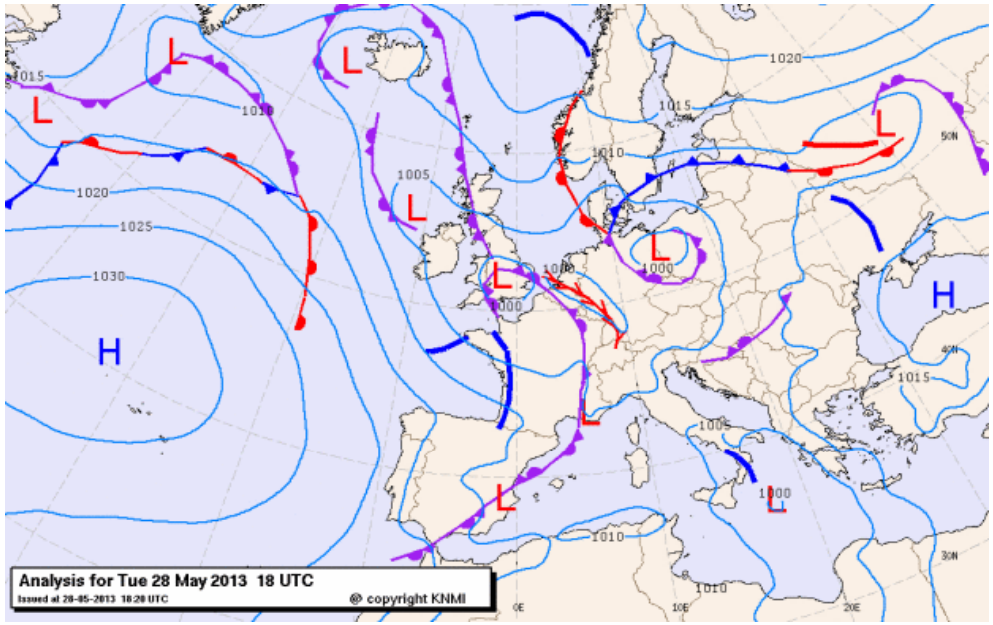


Data assimilation in HARMONIE
Impact on the wind profile

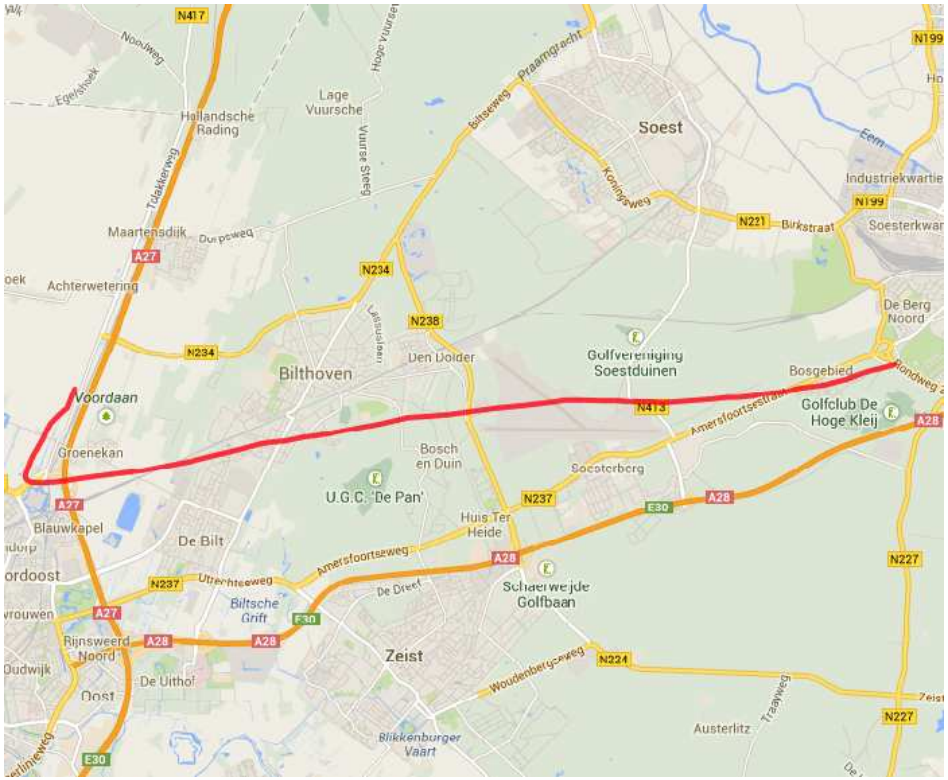


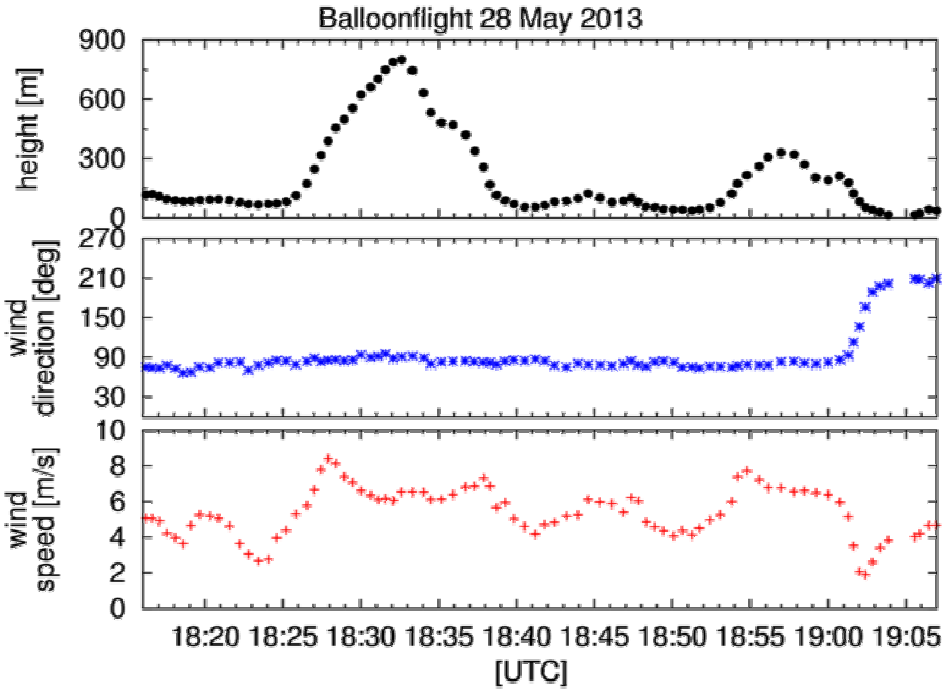
thunderstorm / convergence line, 28 may 2013



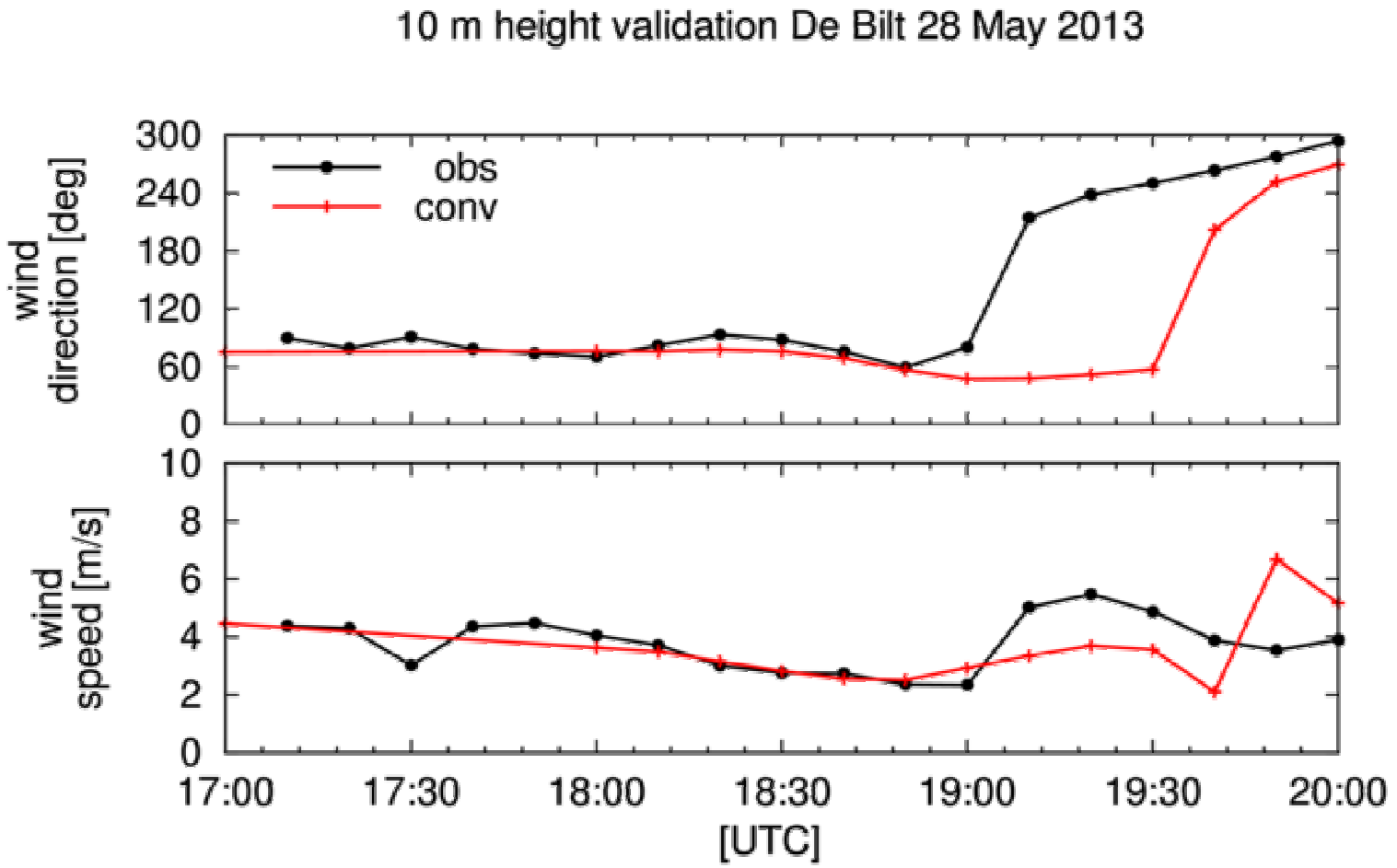


28 May 2013 Wind shift of 120 degrees

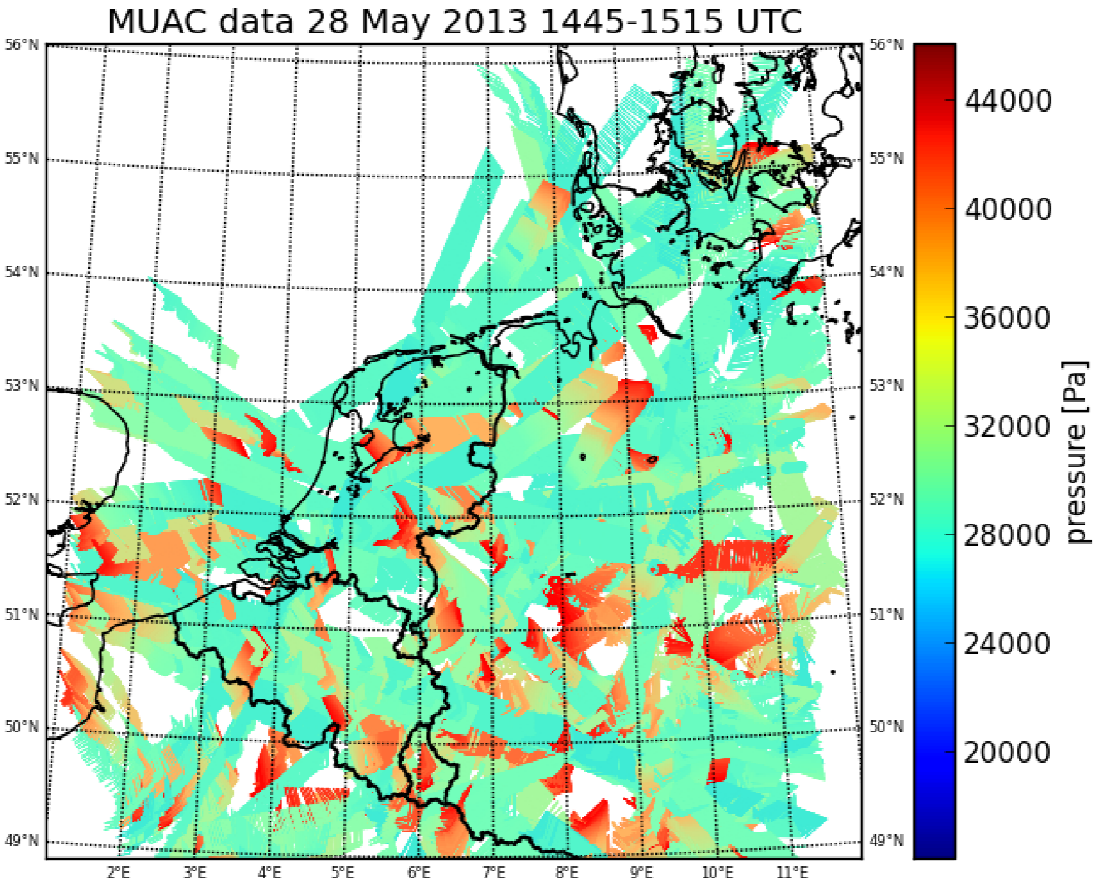




Model too late, how to improve?



Apply Mode-EHS observations !!

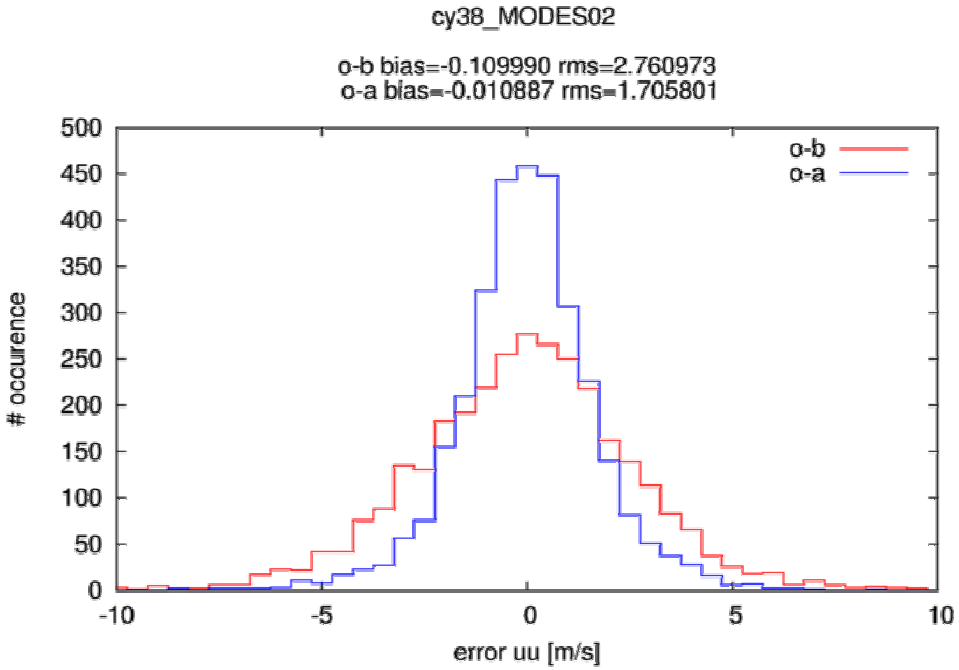


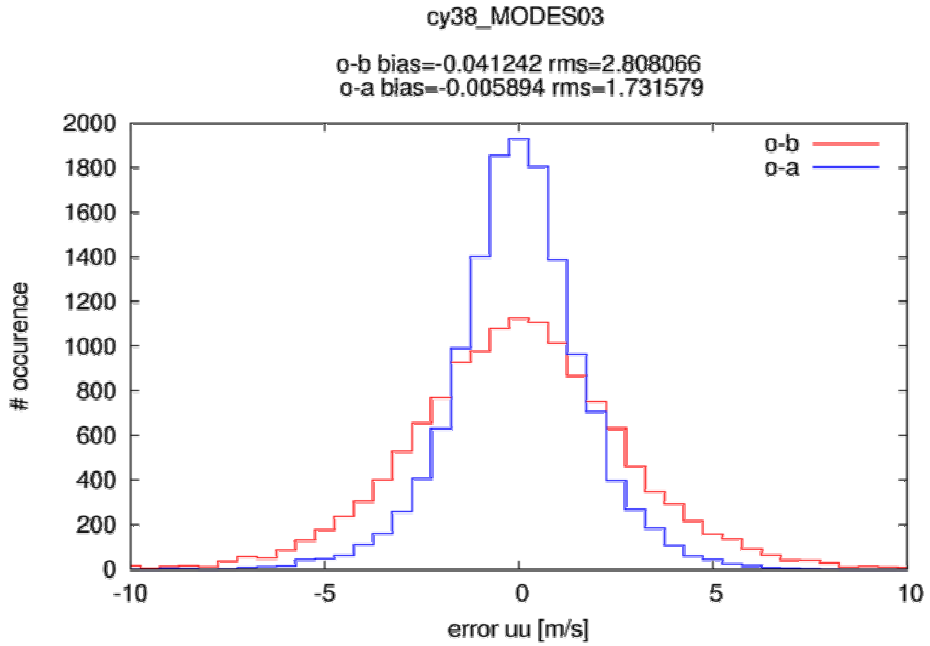
Mode-S EHS data

HARMONIE cycle 38h1.2
800 x 800
3DVAR
3h cycling interval
SYNOP, TEMP, SHIP, BUOY, AMDAR

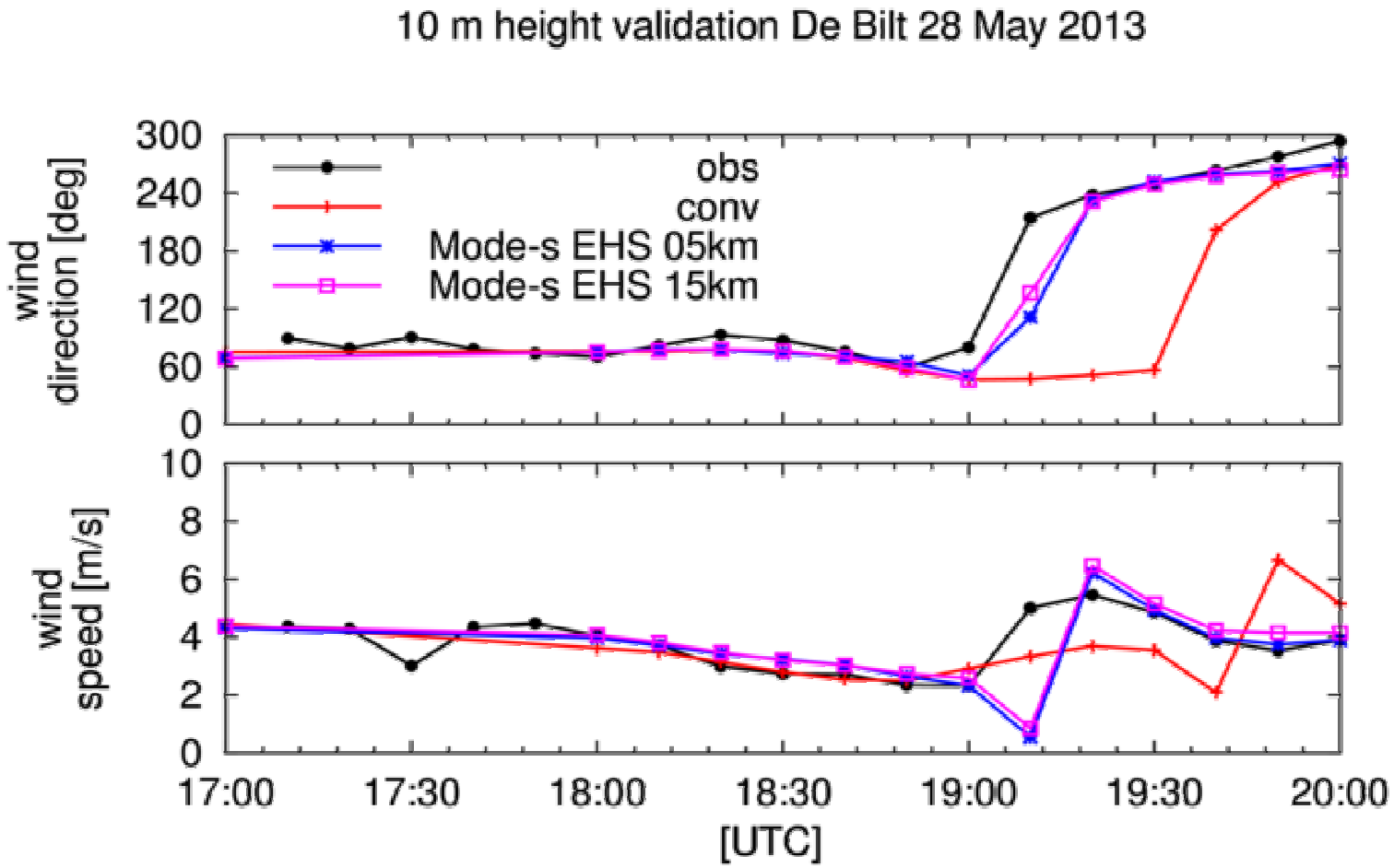
Mode-S EHS data (from Air Traffic Control)
Thinned in time +/-15 min around analysis time
Thinned in space RFIND_AIREP=15 km

Departure statistics



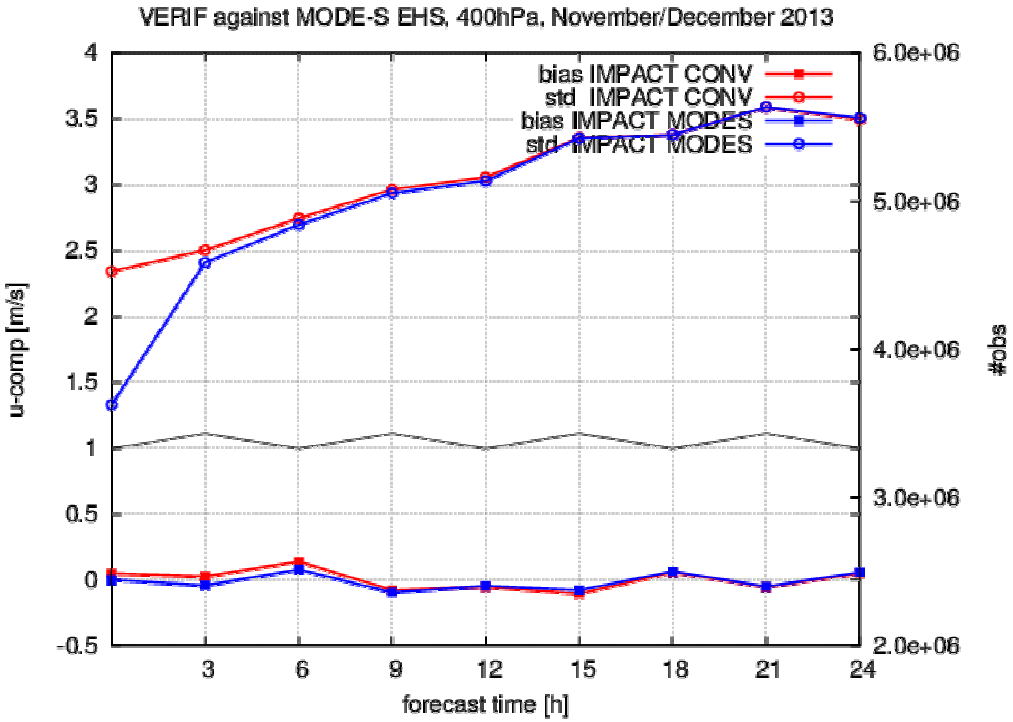


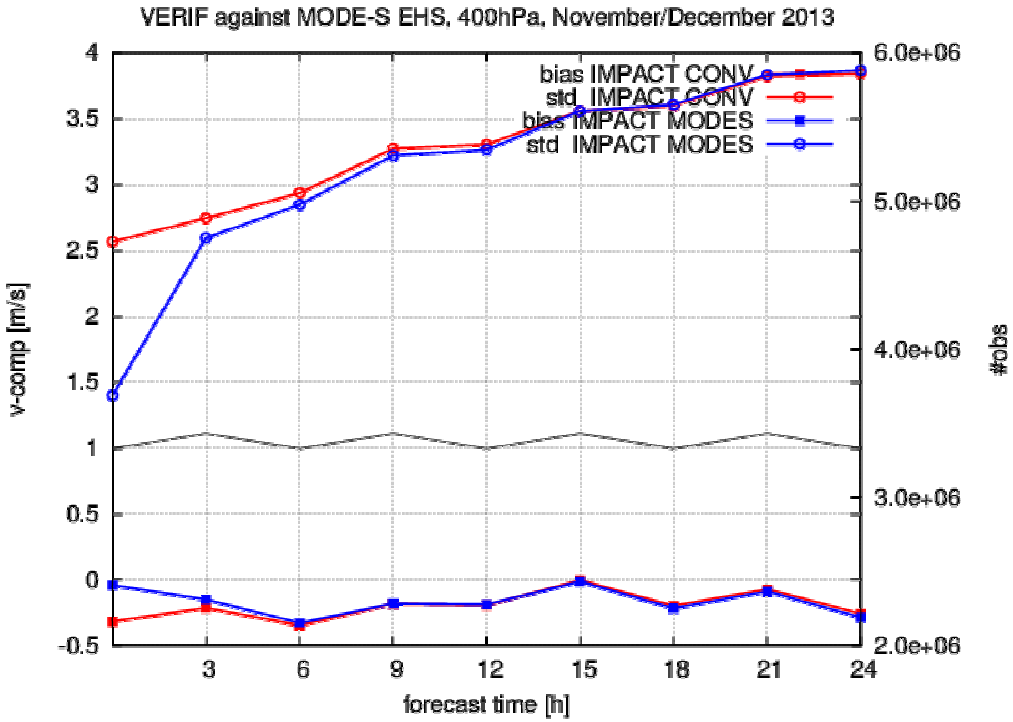
Mode-S EHS data



Mode-S EHS data

Verification 18 Nov – 31 Dec 2013



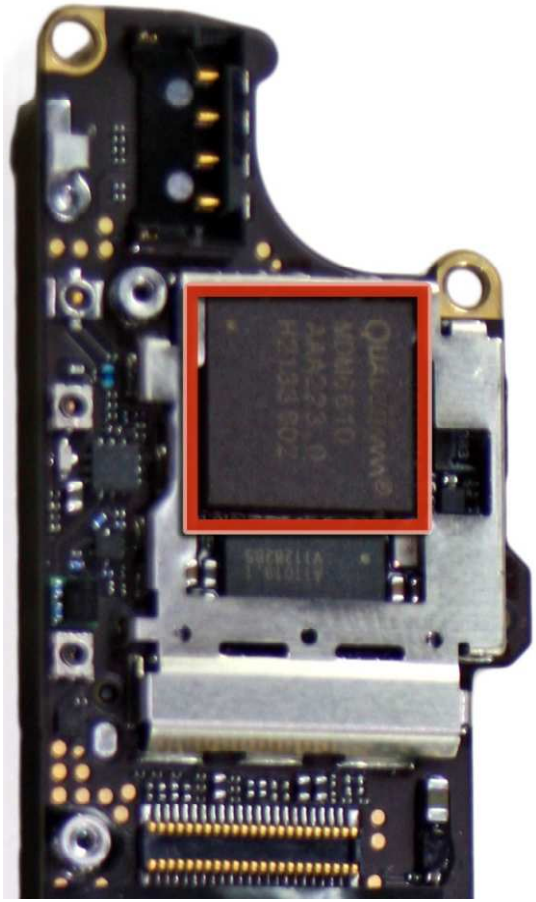


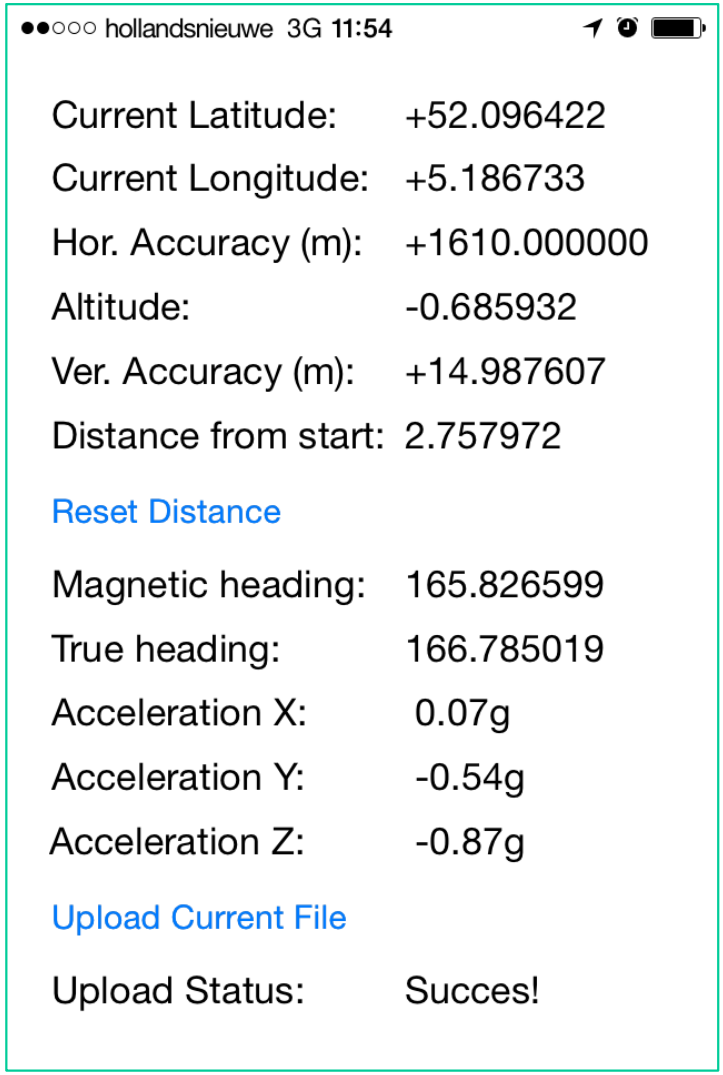
Balloon tracks were obtained by collecting GPS-navigation data afterwards

Can we collect them automatically?

- Transponder via Air Traffic Control (difficult)
- Smartphones (easier)

App on smart-phone

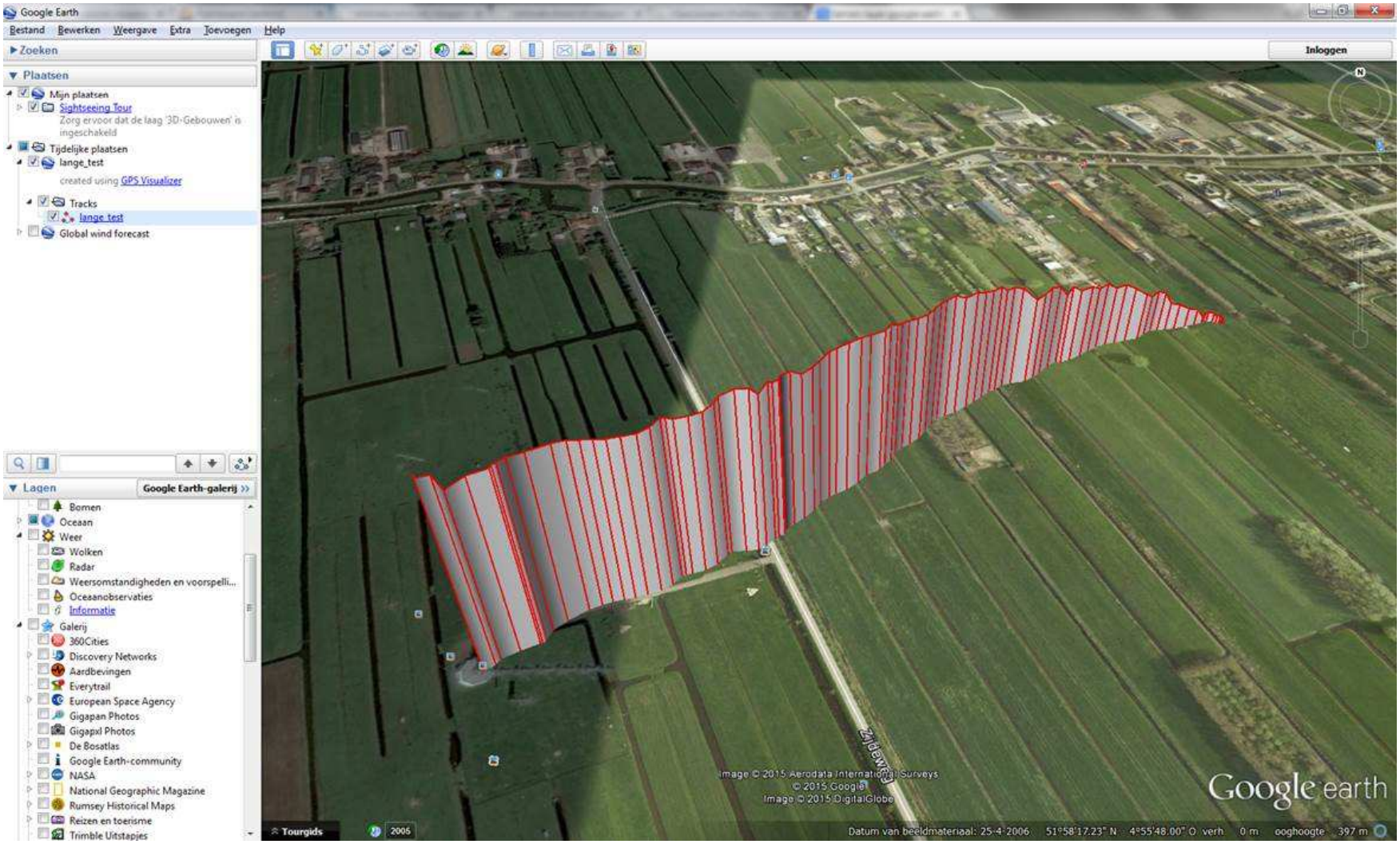




SMART-PHONE with parachute launched

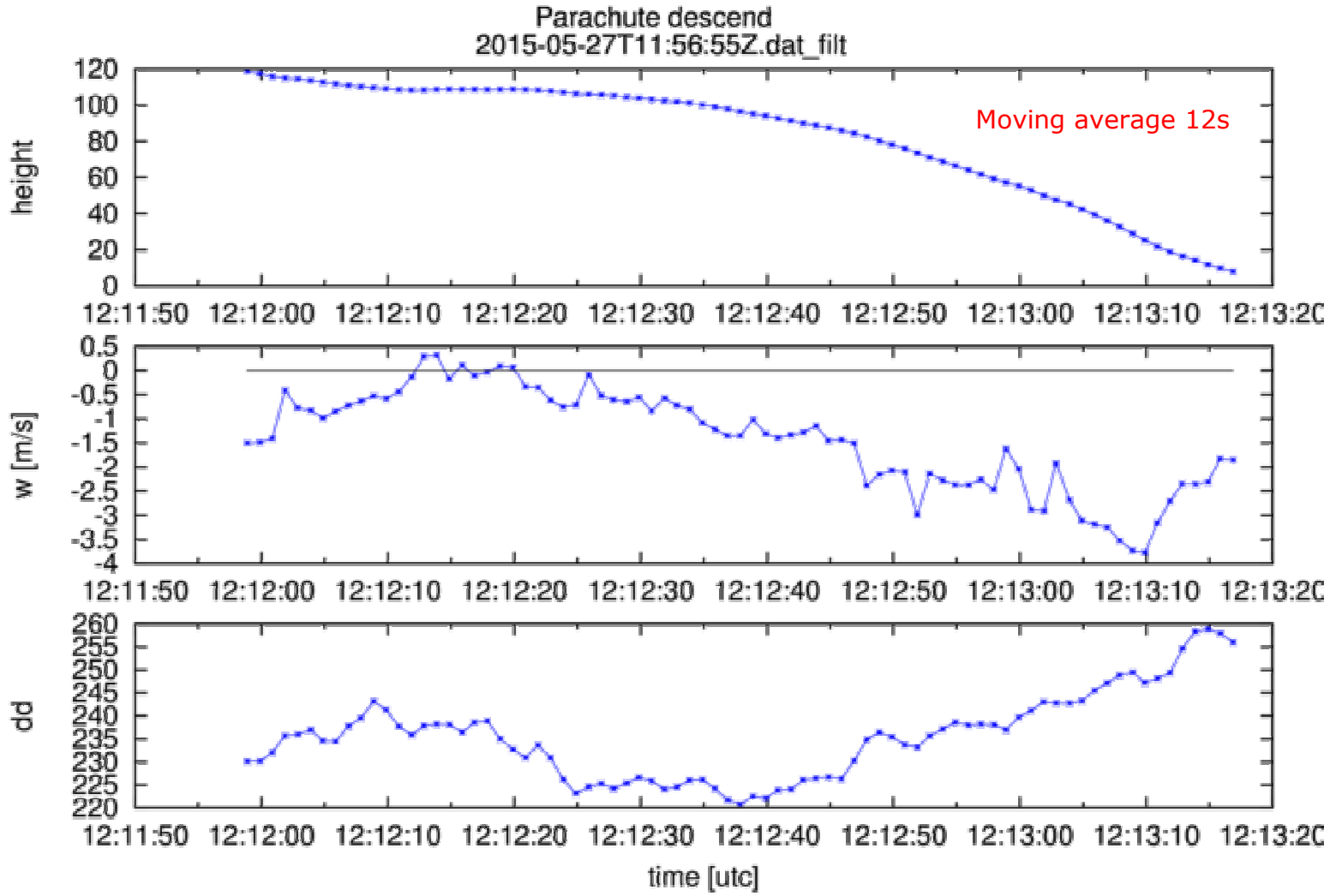
Parachute/smart-phones

3d trajectory of the parachute descend

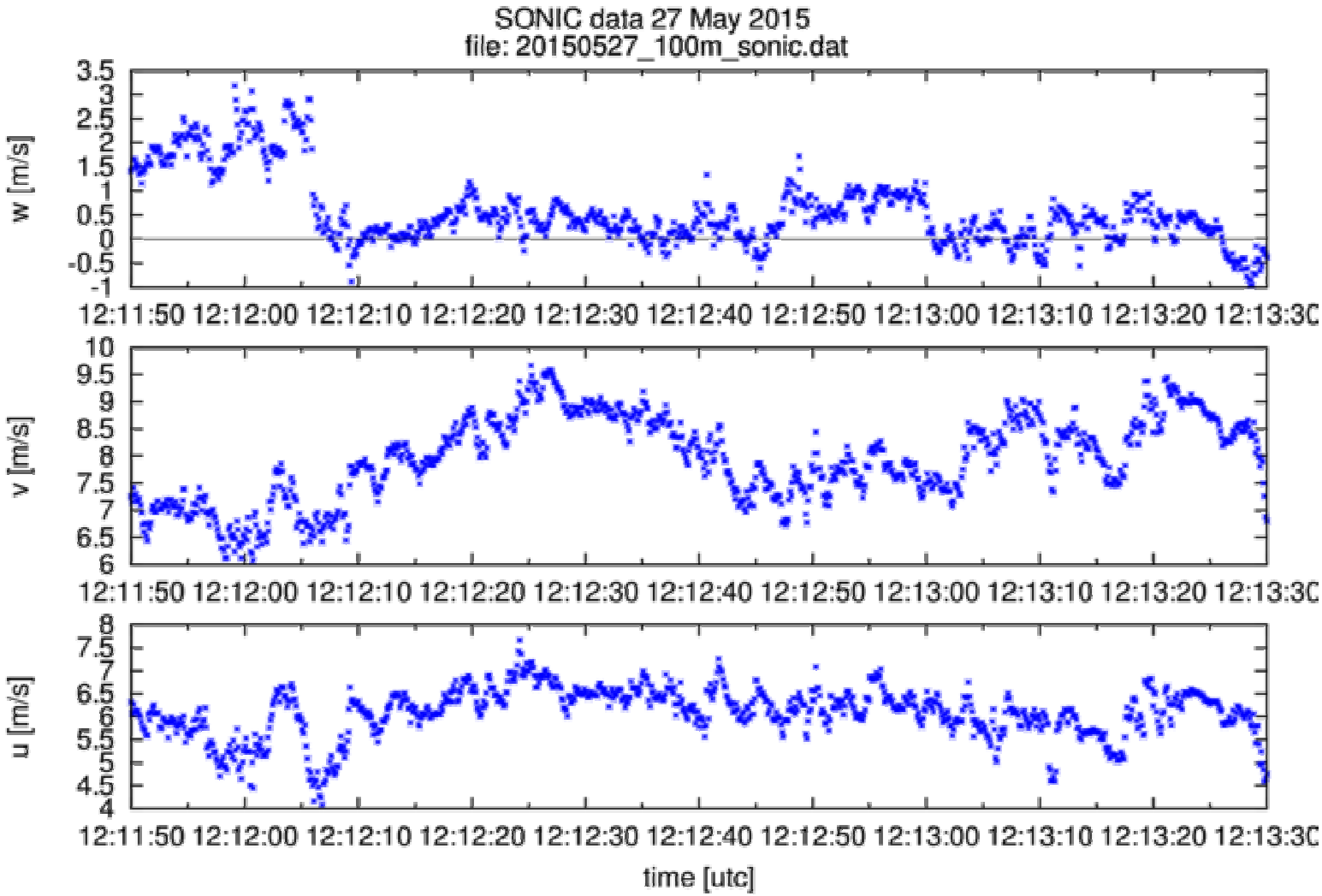


Parachute/smart-phones

Why did this descend last so long?

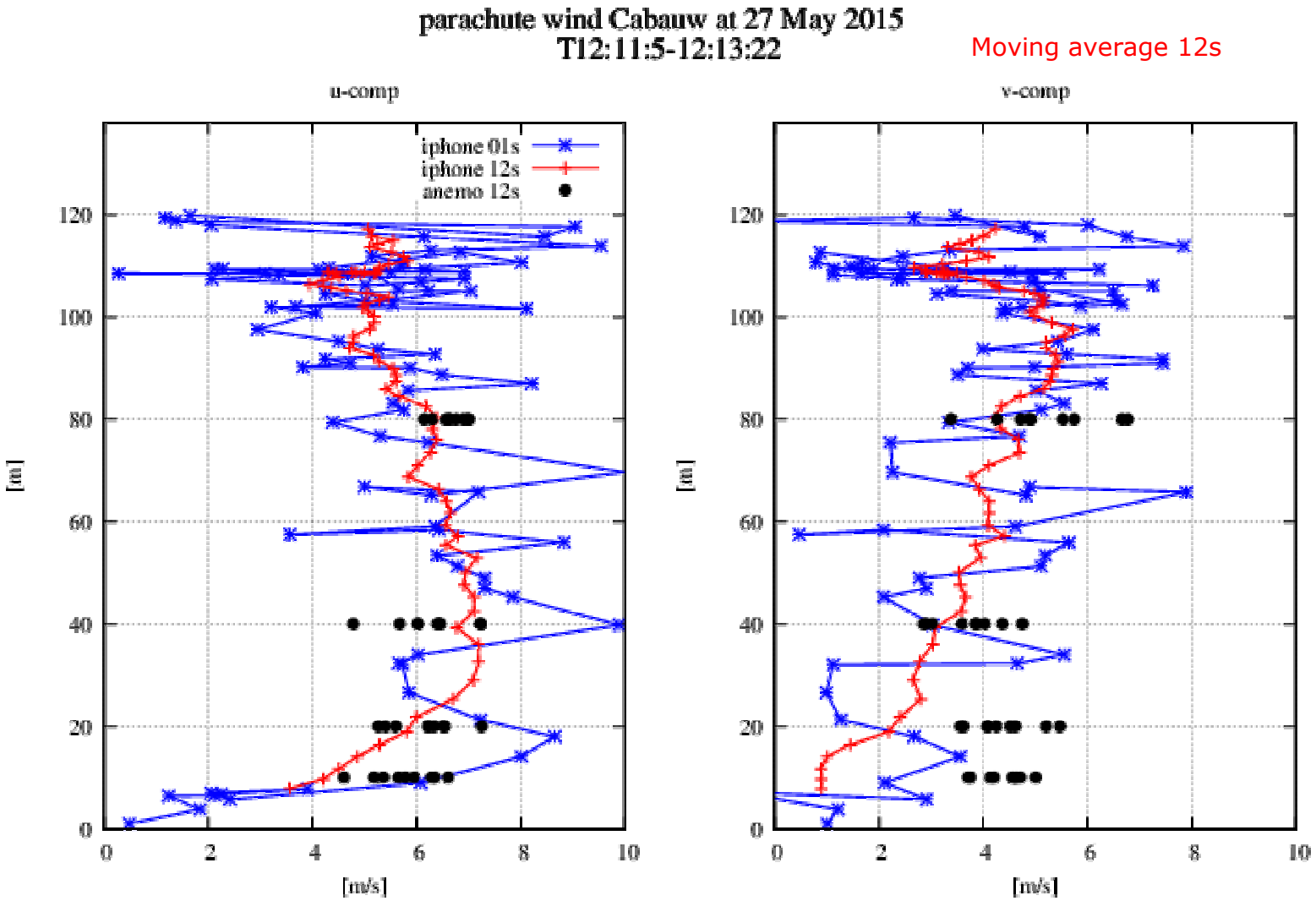


SONIC Anemometer at 100m in Cabauw tower



Parachute/smart-phones

Validation



Conclusions

- Smart-phones on moving platforms can be used to collect wind information
- Parachute descends reveal very local wind effects like vertical updrafts
- Hot-air balloon tracks contain valuable wind information in the ABL
- Mode-S EHS observations reduce wind shift timing errors and improve the scores

Outlook

- Mode-S EHS data in 4D VAR data assimilation
- Test smart-phone during Hot-air Balloon flight