

Satellite and Airborne Wind-LIDAR Atmospheric Motion Vectors Comparison - A Case Study

Iliana Genkova*, Martin Weissmann**, Steve Wanzong***

* Career Ready, Utrecht, The Netherlands

** *Deutsches Zentrum für Luft- und Raumfahrt, Institut für Physik der
Atmosphäre, Oberpfaffenhofen, Germany*

*** *CIMSS/University of Wisconsin - Madison*



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- The launch of ESA's Atmospheric Dynamics Mission Aeolus instrument (ADM-Aeolus) - the first Doppler Wind Lidar (DWL) in space is slowly approaching



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- **Do** and **How** ADM-AEOLIS-like wind profiles compare to Satellite AMVs? What can we learn?



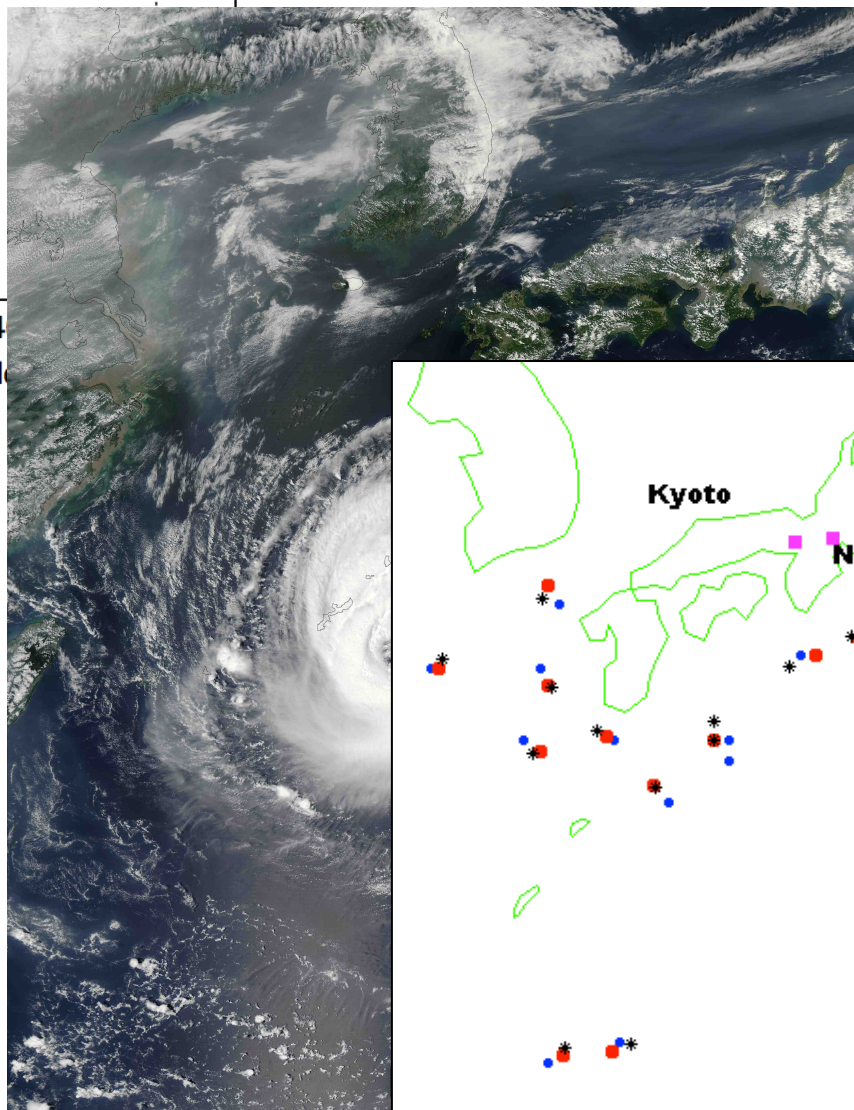
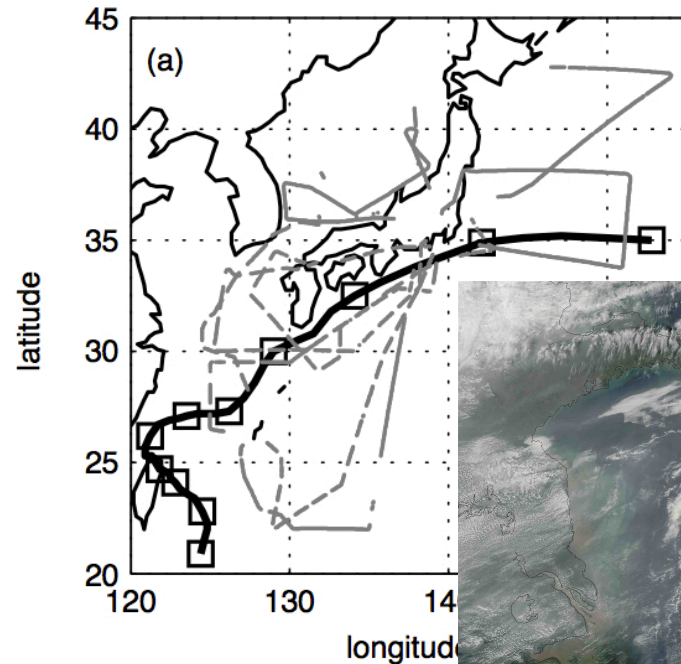
Data and Method

- THORPEX Pacific Asian Regional Campaign (T-PARC) 2008 - airborne Doppler wind lidar (DWL) profiles (~2500) measured by the DLR Falcon aircraft during the life cycle of Typhoon Sinlaku in the western North Pacific (11 – 21 September 2008) with a 2 μm scanning coherent DWL;
- DWL profiles with a horizontal resolution of about 5 km and a vertical resolution of 100 m ;
- On average, every DWL wind profile during T-PARC provided wind information for about 20 – 25% of the vertical profile (Weissmann et al., 2005). The highest coverage of DWL observations occur between 250 and 300 hPa and the second highest coverage in the atmospheric boundary layer due to higher aerosol concentrations, whereas the coverage was particularly low between 500 and 800 hPa;
- Only assimilated profiles are used

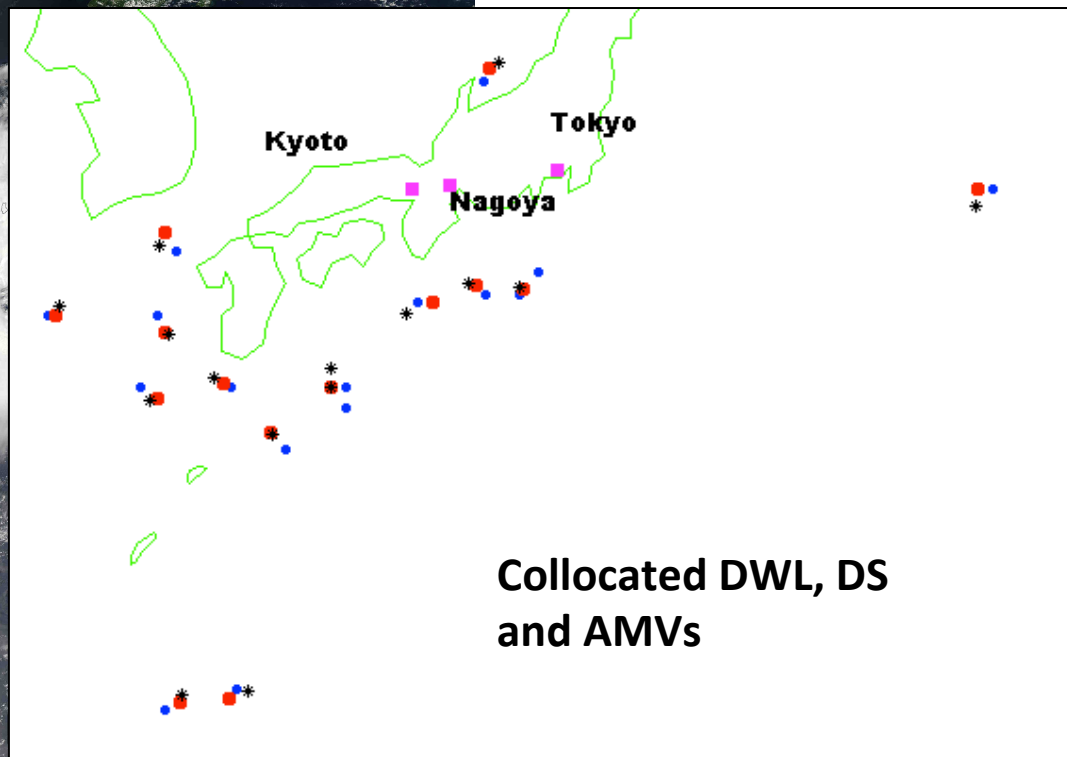
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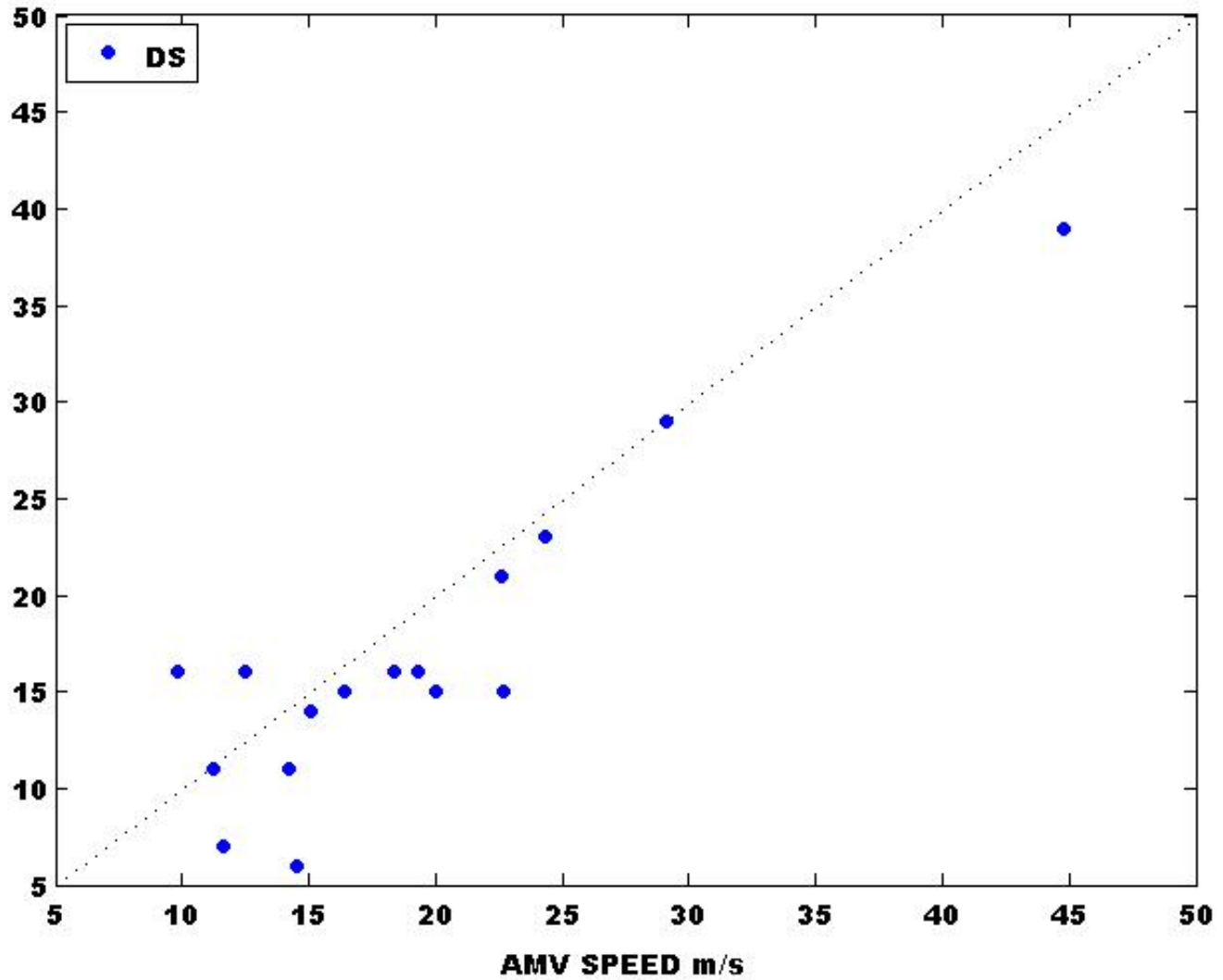
- Dropsondes (DS) system on board of Falcon, every 3h, not assimilated
- Satellite AMVs from MT-SAT / JMA – produced every 6hours, to sync with the model;
Retrieval: Target/Track/HA; 32x32pix target, 64x64pix search box, highest CTP peak, second intermediate product is reported as final AMV vector at the time of the 3rd image;
- Only assimilated winds are used in the study (strict quality control);
- Triple Collocation (DWL, DS, AMV) : ± 30 min, 0.5 deg; ± 50 hPa
- 16 points found: between 200-300hPa, and 1 at 850hPa)
- Simple statistics (preliminary results)

<- Location of DWL profiles (grey) and Typhoon Sinlaku (black line - according to the JMA best-track) for 11–21 September 2008; 'Squares' at 00UTC;

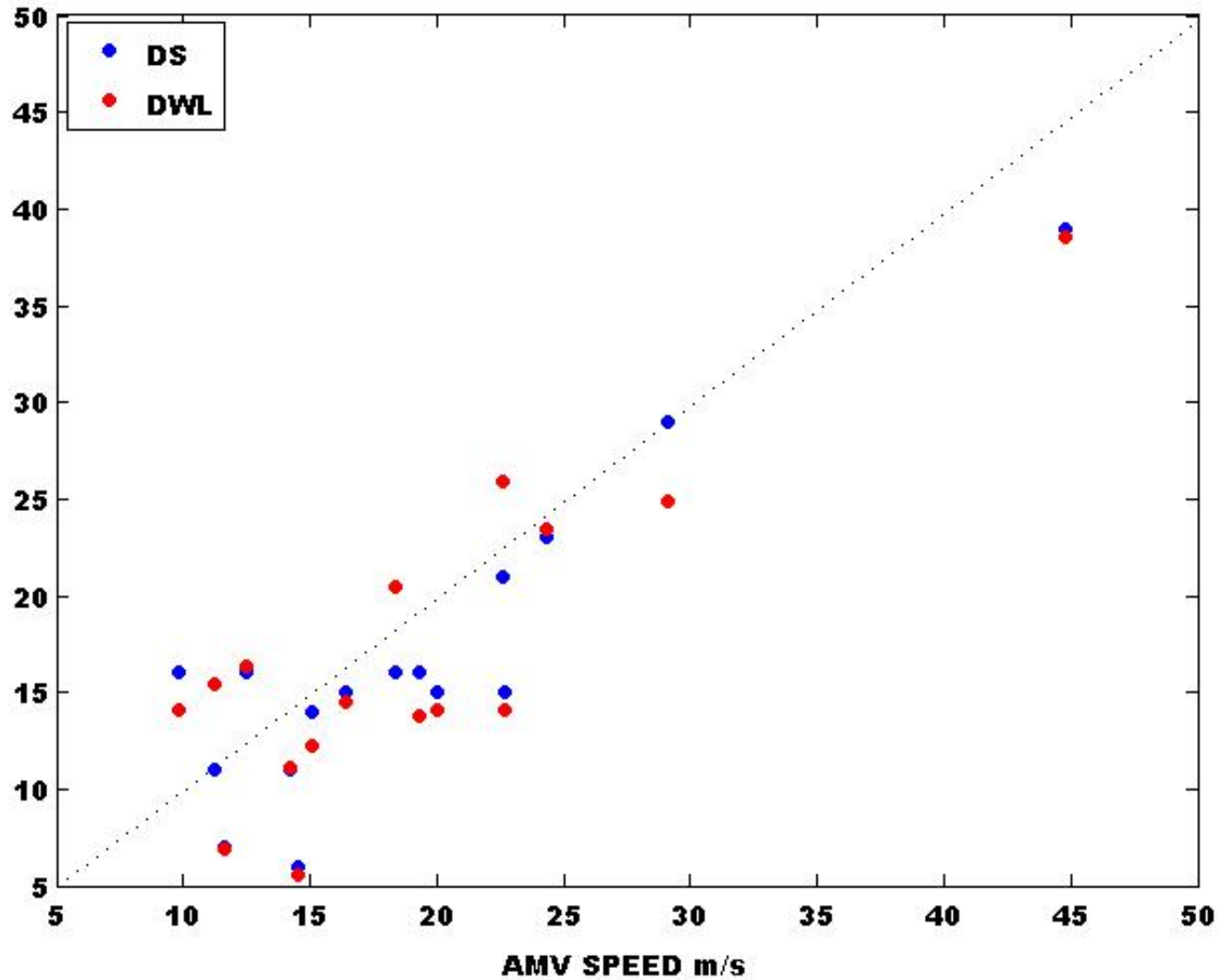


**->
Sinlaku
09/19/2008**

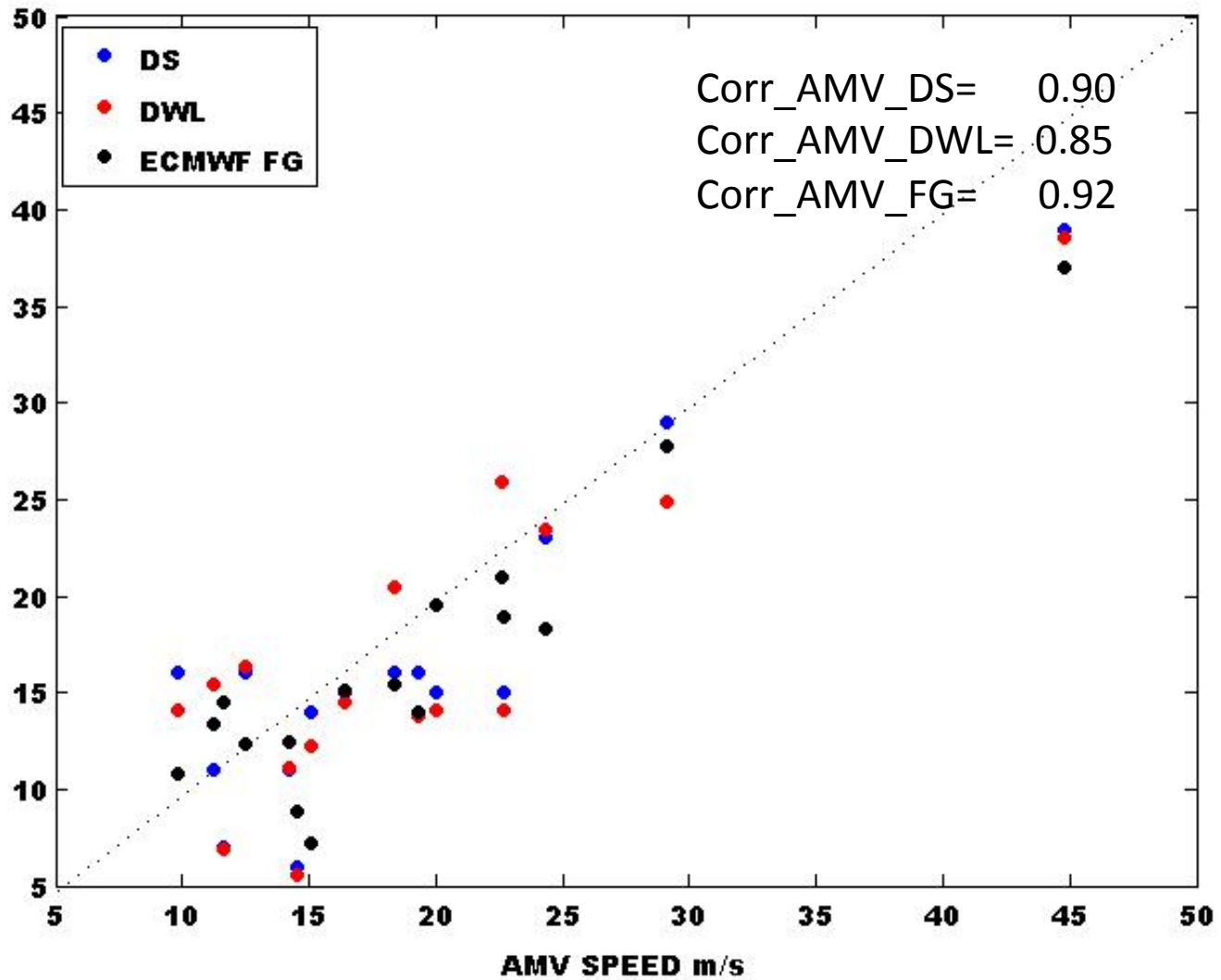




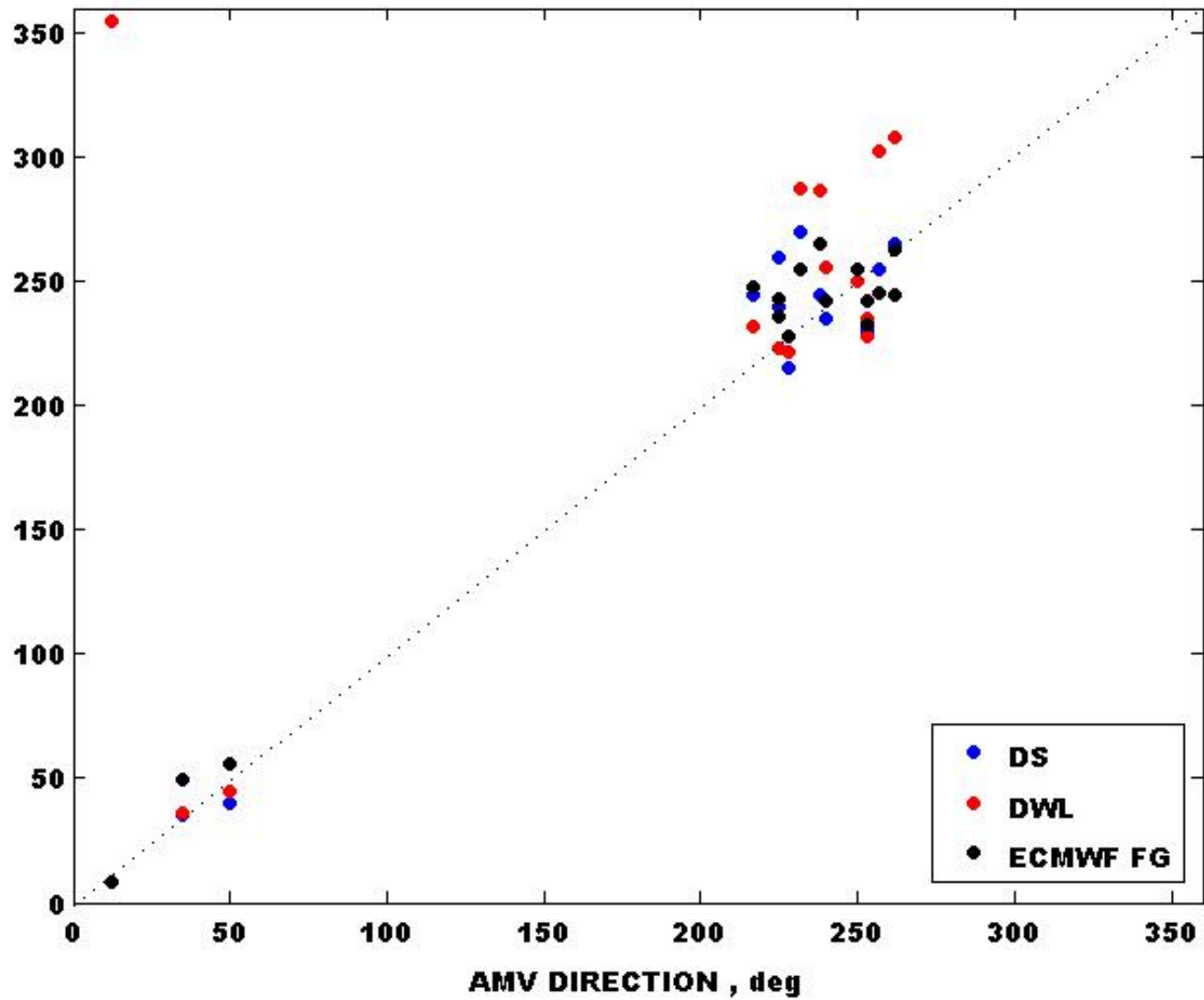
AMV Speed (x) vs. Dropsonde Speed (y) , [m/s]



AMV Speed (x) vs. Dropsonde Speed / DWL (y) , [m/s]



AMV Speed (x) vs. Dropsonde Speed/DWL/ECMWF (y) , [m/s]



AMV Direction (x) vs. Dropsonde Direction/DWL/ECMWF (y) , [deg]

Statistics

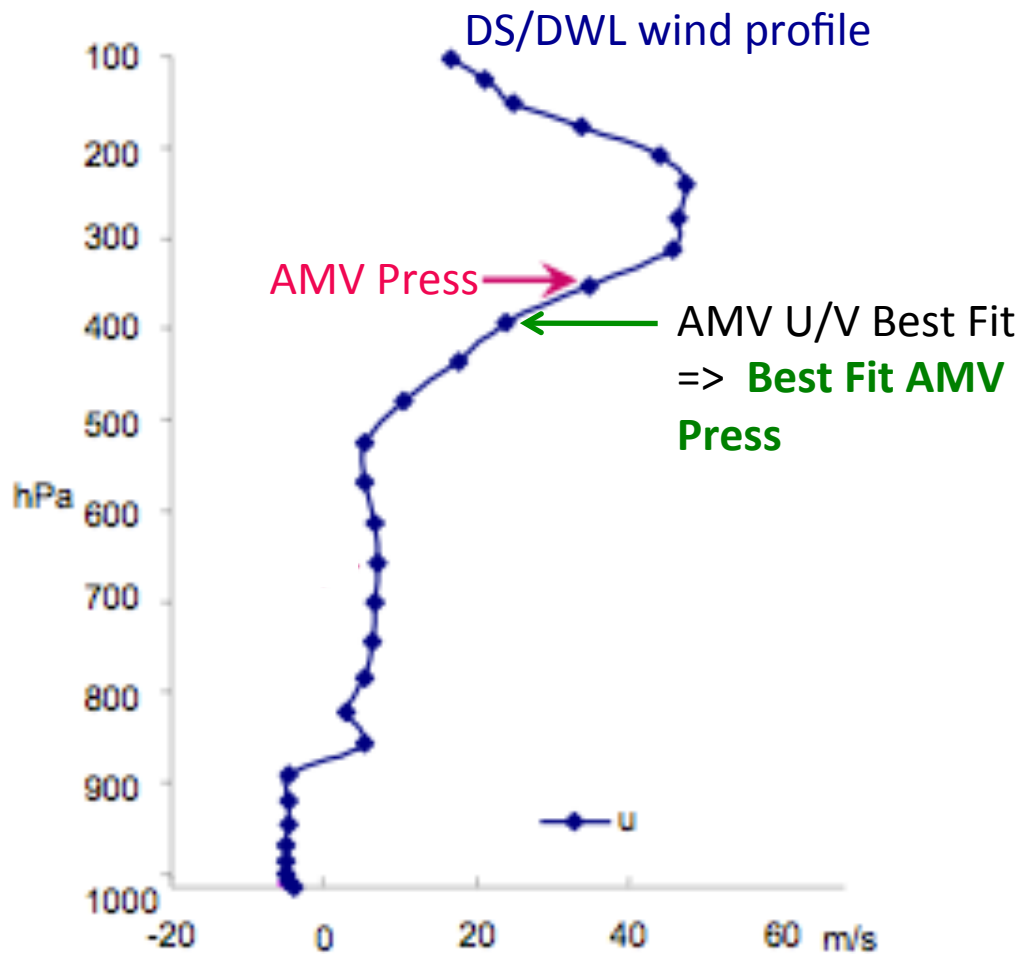
Speed, m/s	Number AMVs	Mean	STD
AMVs	16	19.15	8.68
Dropsondes	16	16.87	8.15
DWL	16	16.96	8.13
ECMWF FG	16	16.66	7.38

Speed, m/s	Number AMVs	Mean	STD
AMVs - FG	16	5.55	2.43
Dropsondes - FG	16	3.80	3.38
DWL - FG	16	7.14	4.32

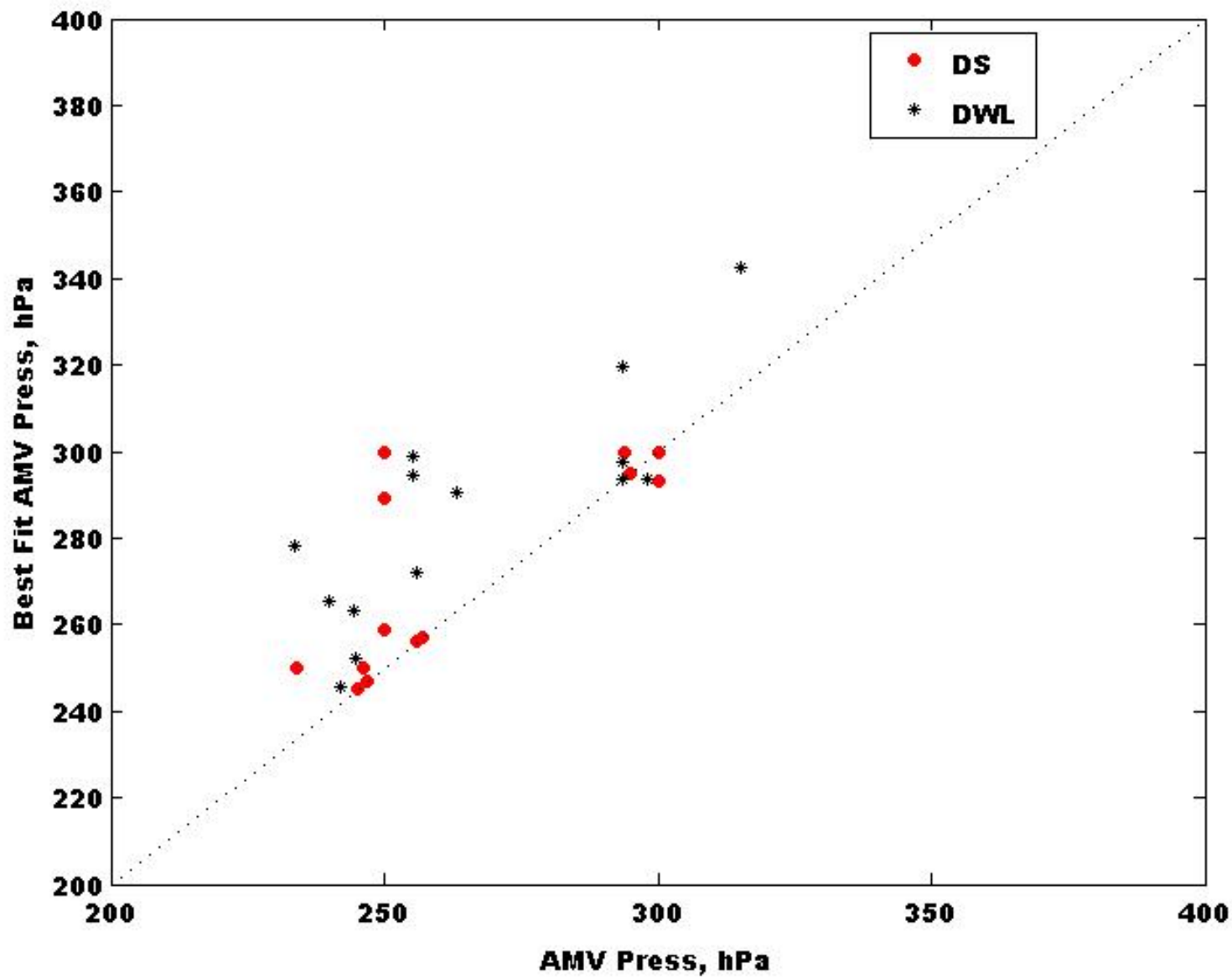
Statistics

	Number AMVs	Speed Bias	Speed RMS
AMV - DS	16	2.28	6.9
AMV - DWL	16	2.18	9.2
AMV - MOD	16	2.49	6.0
DS - MOD	16	0.21	5.2
DWL - MOD	16	0.30	8.4

AMV Press (x) vs. "Best-Fit" Dropsonde/DWL Press (y), [mBa]



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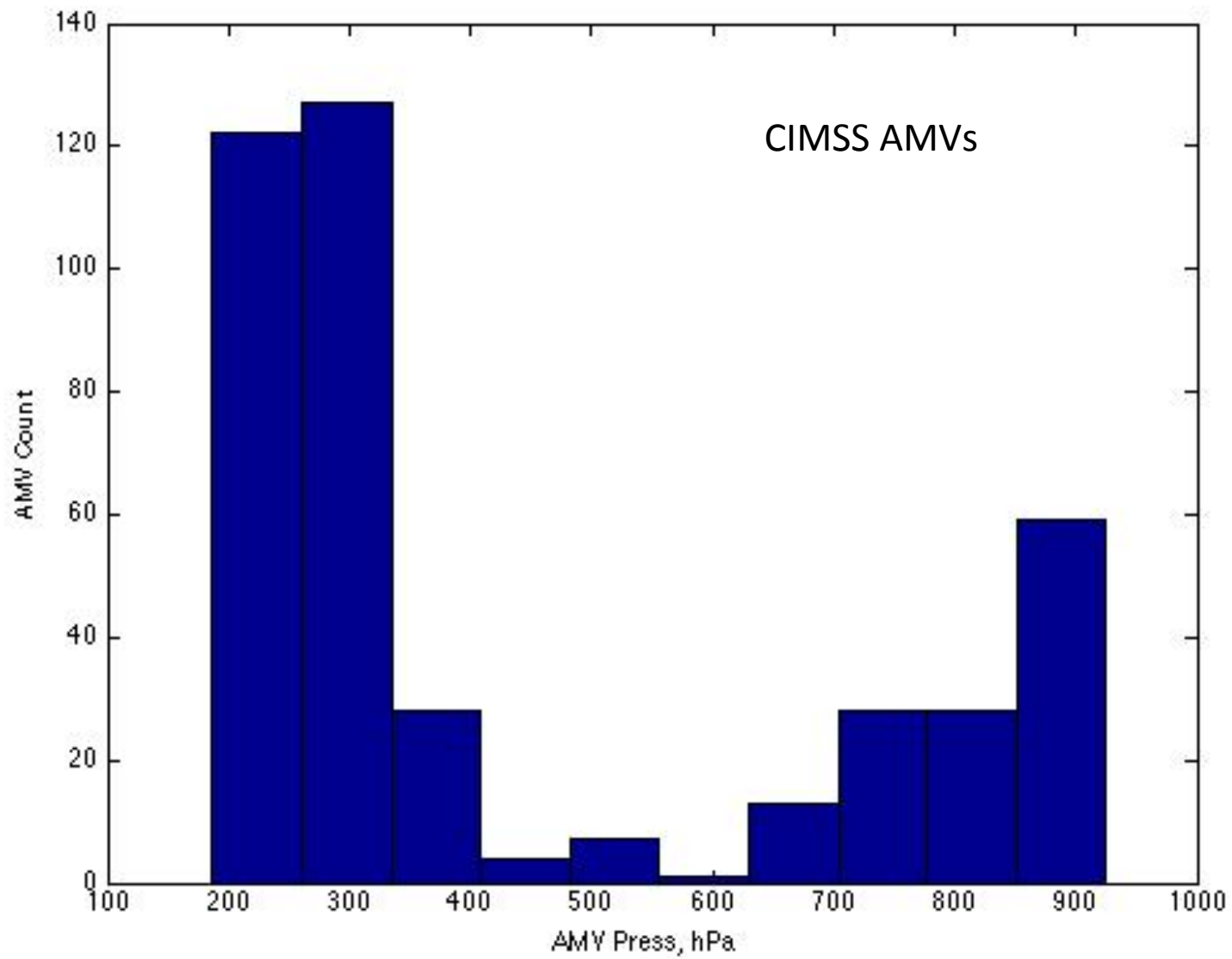


Conclusions/Future plan

- T-PARC Sinlaku campaign allows mostly for high and semi-transparent clouds derived AMV comparison / Use additional DWL data/DA experiments
- Low number of collocation due to 6 h AMV production cycle / Use CIMSS 3h AMVs (~400 collocation) – look into HAMs, Low/Mid/High AMVs
- ‘Best Fit’ places the winds at lower altitudes / Use backscatter info for further understanding of the benefits of ‘Best Fit’ approach and AMV/DWL synergistic use
- Repeat inter-comparison only for U component and address representativeness issues

Statistics

	Number AMVs	Speed Bias	Speed RMS
AMV - DS	16 / 417	2.28 / 0.47	6.9 / 8.73
AMV - DWL	16 / 417	2.18 / -0.07	9.2 / 9.18
AMV - MOD	16 / 417	2.49	6.0
DS - MOD	16 / 417	0.21	5.2
DWL - MOD	16 / 417	0.30	8.4



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