Measurements of snowfall during MOSAiC

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Main objective: to produce a high temporal resolution MOSAiC snowfall rate/flux product

Total accumulations (mm of melted water: 11 OCT 2019 -14 May 2020)

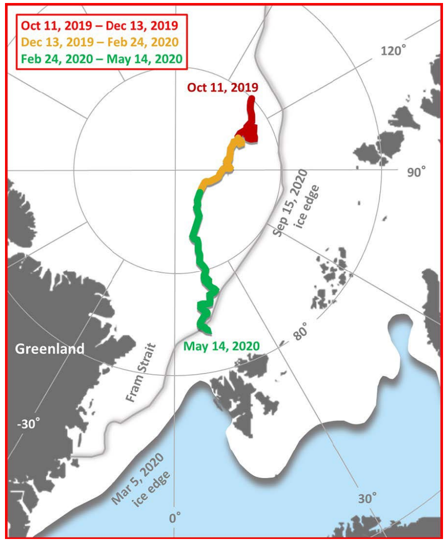
Sensor/Month		10/19	11/19	12/19	01/20	02/20	03/20	04/20	05/20	Total
KAZR (0.17 km)	ship	5.9	12.5	12.1	12.3	17.1	16.3	17.4	17.9	111.5
PWD_1	ship	12.9	10.2	7.2	9.4	16.6	6.3	18.9	27.1	108.6
PWD_2	camp	8.3	16.0	24.1	15.9	47.1	11.4	39.9	9.5	172.2
Pluvio	camp	11.9	8.1	12.8	7.3	72.6	60.7	54.2	0.9	228.5
$PARSIVEL_1$	ship	3.1	4.8	4.0	2.9	3.3	13.8	19.5	9.4	60.8
KAZR (0.23 km)		6.7	14.1	14.7	13.5	19.1	18.1	19.7	20.5	126.4

Snow over ice measurements: a general increase during Nov 1, 2019 - Feb 20, 2020

a decrease after February 20, 2020 due to erosion processes

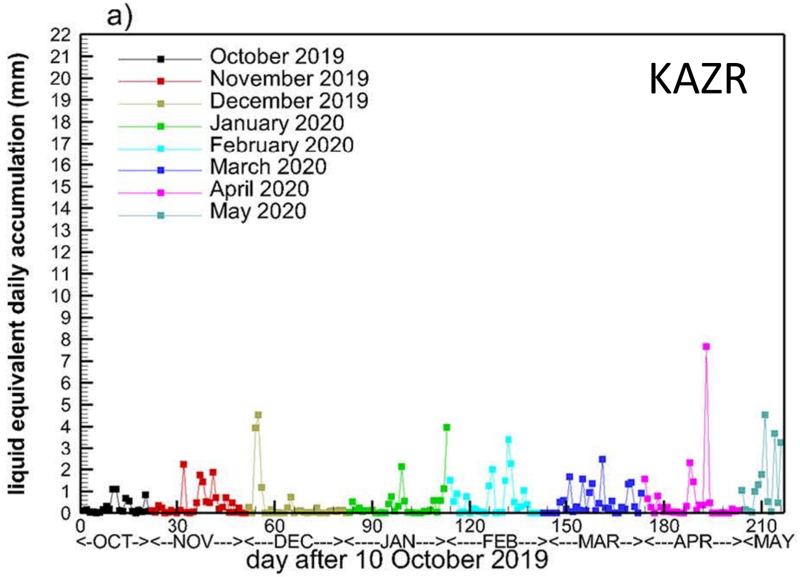
Nov 1, 2019 – Feb 20, 2020: KAZR retrievals- 56 mm,

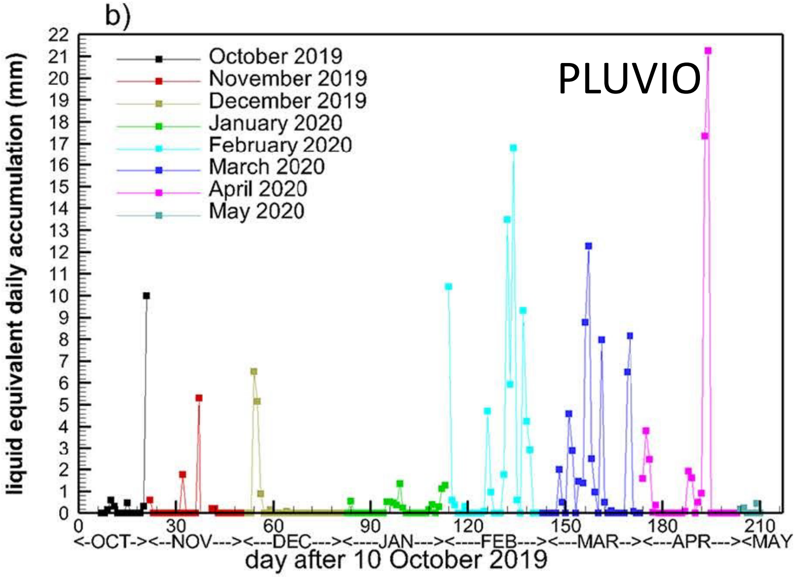
snow over ice measurements - 36 mm (assuming no erosion)

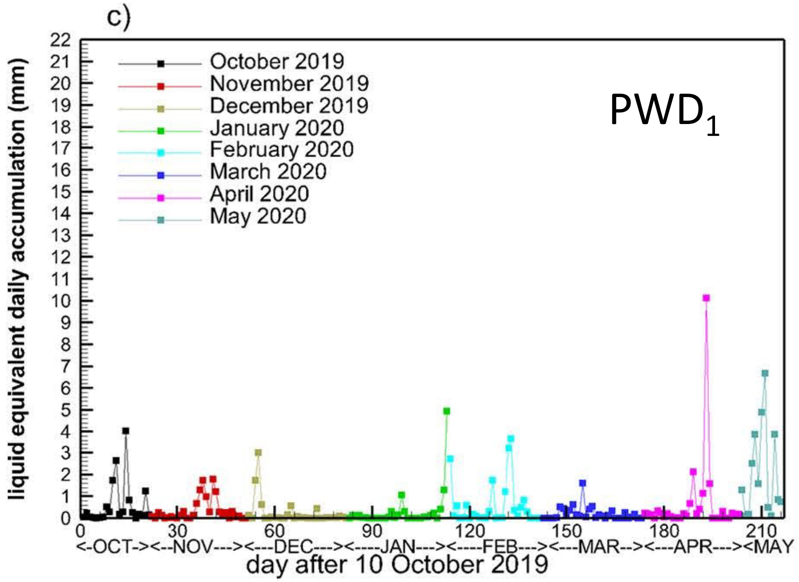


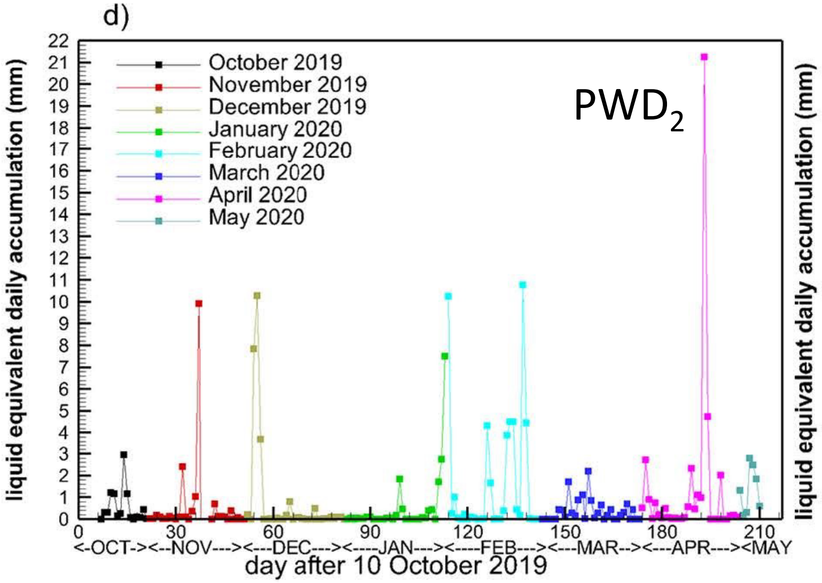
More details are in the poster

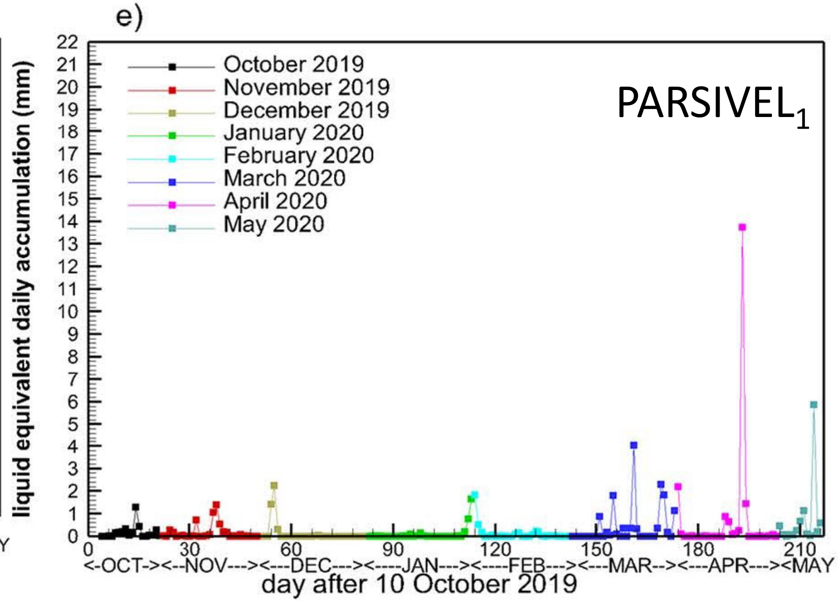
MOSAiC daily accumulations [35 days with accumulation greater than 1 mm (melted)]



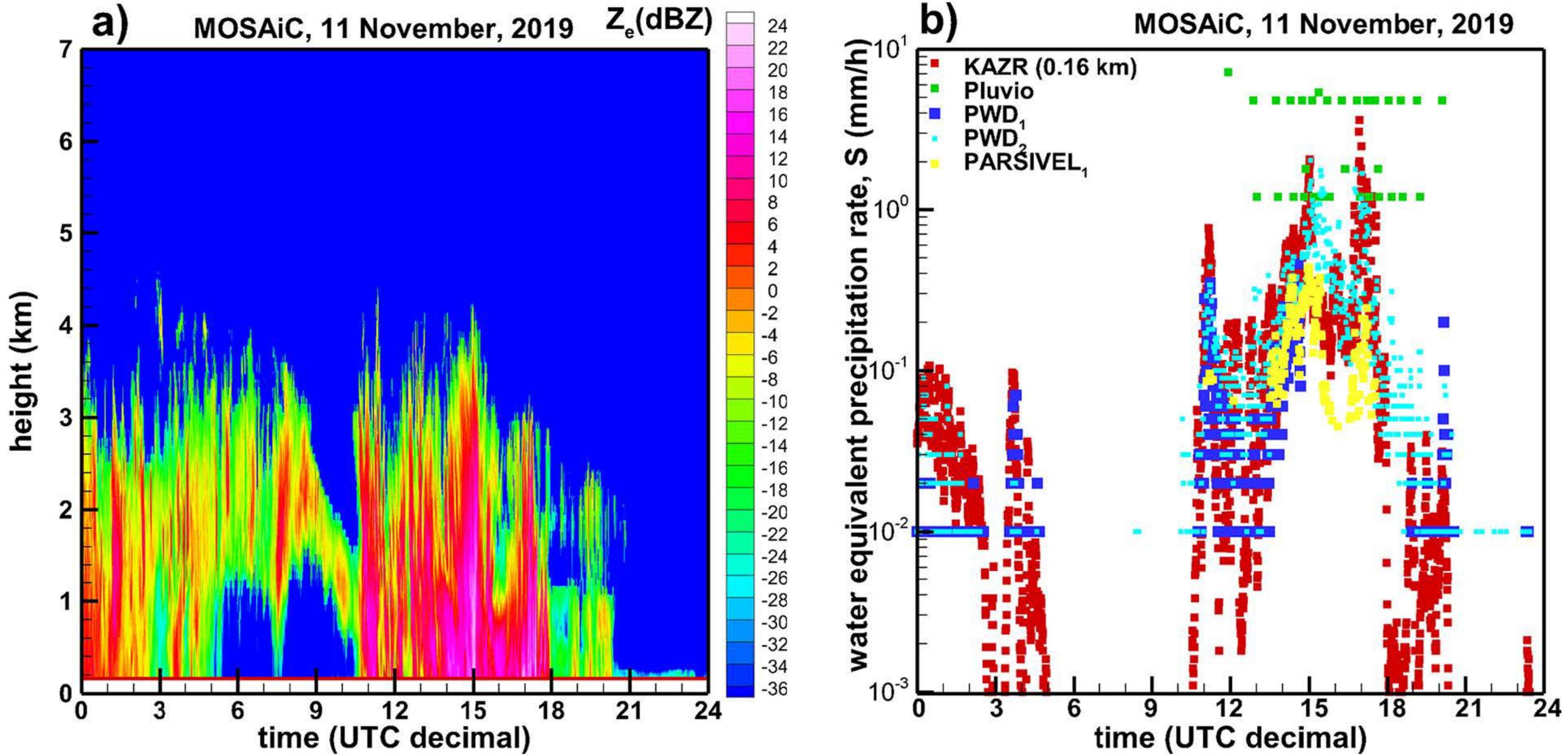








Comparisons of instantaneous snowfall rate estimates



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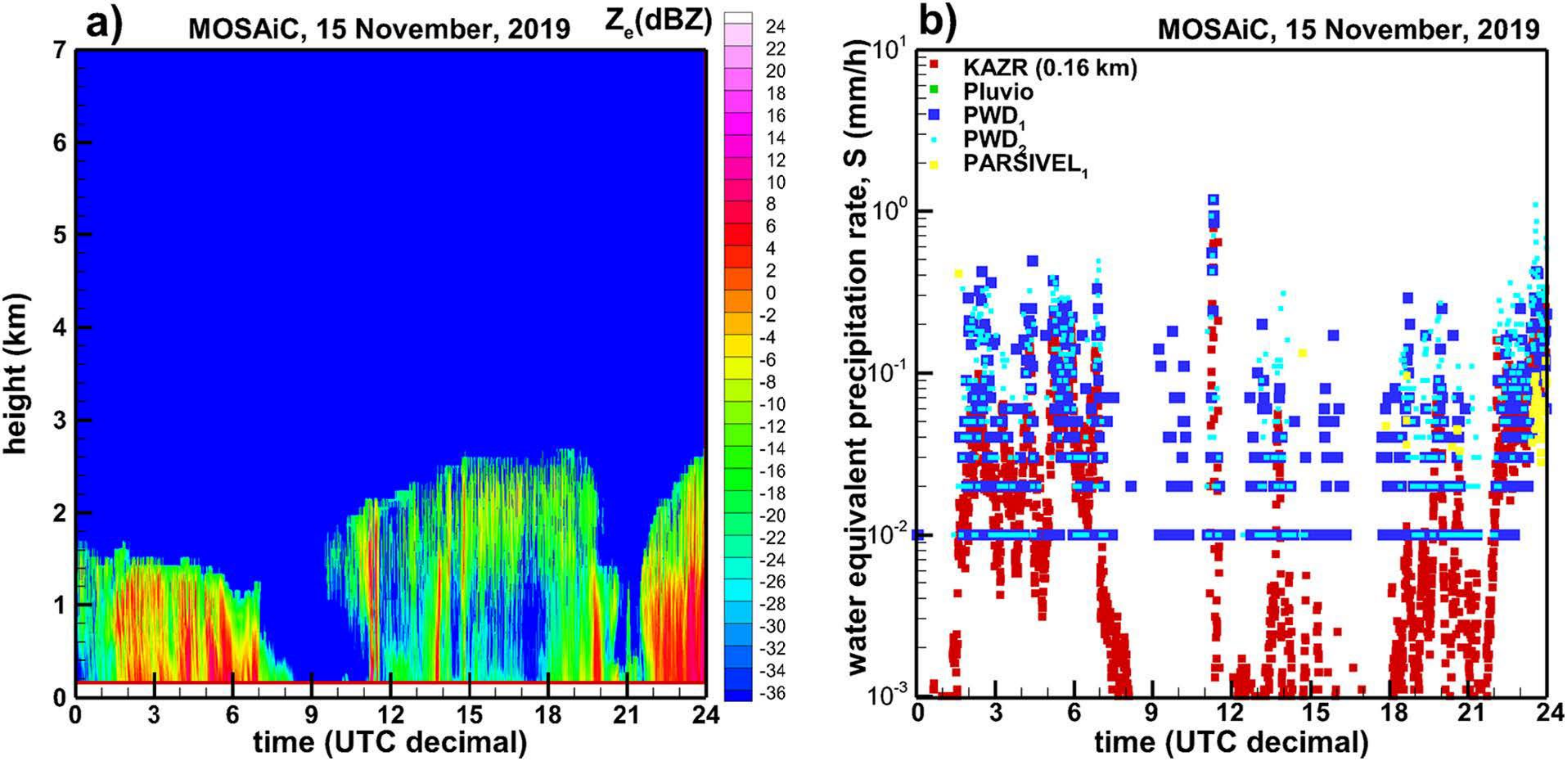

Conclusions

KAZR-based retrievals were the most consistent source of instantaneous snowfall rate estimates during MOSAiC in terms of the data availability

Radar-based measurements are expected to be the least affected by artifacts due to blowing snow (the lowest meaningful height ~ 160 m)

~1 dB uncertainty in KAZR calibration results in ~20% uncertainties in snowfall rates. There is ~30% uncertainty due the choice of the Z-S relation.

PARSIVELs did not provide data over extended periods. Standard PARSIVEL products assume liquid water drops. If an appropriate for snow mass-size relation is applied $PARSIVEL_1$ data favorably compare with KAZR estimates

The accumulation results from two identical Vaisala PWD optical sensors (icebreaker and ice camp) are mutually biased by about a factor of 1.7.

30-sec resolution KAZR-based snowfall rate retrievals are available as a PI product from the ARM archive: https://dx.doi.org/10.5439/1853942