Dual-frequency Precipitation Radar

Change of the scan pattern of KaPR

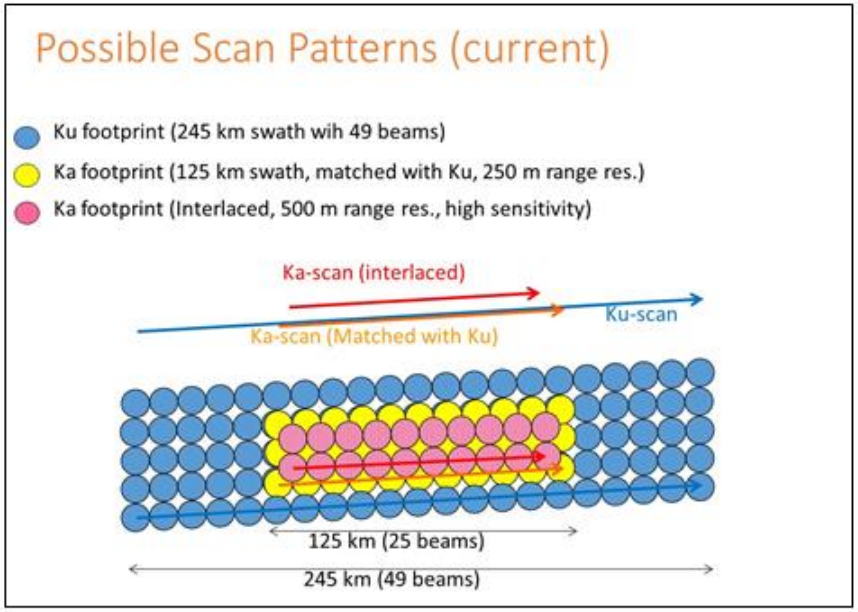
Japan Aerospace Exploration Agency (JAXA)

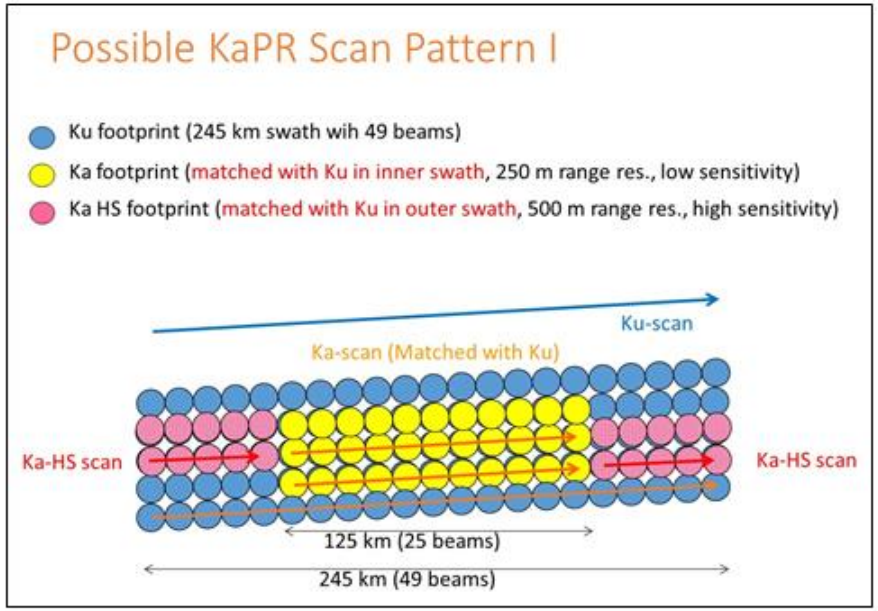
Change of the scan pattern of KaPR

- The JAXA decided a change of the scan pattern of KaPR on 21st May 2018.
  - Product version: 05A→05B on 21st May 2018
  - HS in L2 product will be filled by missing values.
- Here, we show the following points.
  - Advantages of the change of the scan pattern of KaPR
  - Our preparation for the data processing

- We also show that a tentative schedule of the product release for the KaPR full swath valid data to the scientific community.

KaPR's scan pattern change (KaPR only)





Major changes (item A):

- KaPR-HS's scan pattern will be changed.
  → Dual-frequency technique will be applied in a full swath.

Minor changes (item B):

- Scan angle of KaPR-MS scan will be changed to realize improvement of beam matching between KuPR and KaPR (by a request from the DPR-L2 algorithm team).

KaPR Scan pattern experiments

- JAXA conducted two scan pattern experiments and all experiments were completed.

✓ **September 26th -29th in 2017**

- Wide swath test (Sep, 26th to 27th)
- KaPR HS outer swath test (Sep, 27th to 28th)
- Transmitters Off operation (Sep, 28th to 29th)

✓ **February 20th -22nd in 2018**

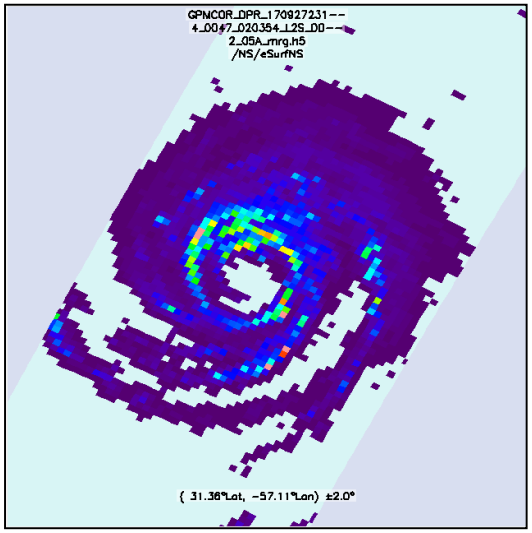
- KaPR HS outer swath test (Feb, 20th to 21st)
- Transmitters Off operation (Feb, 21th to 22nd)

Experiment results for item A (1)

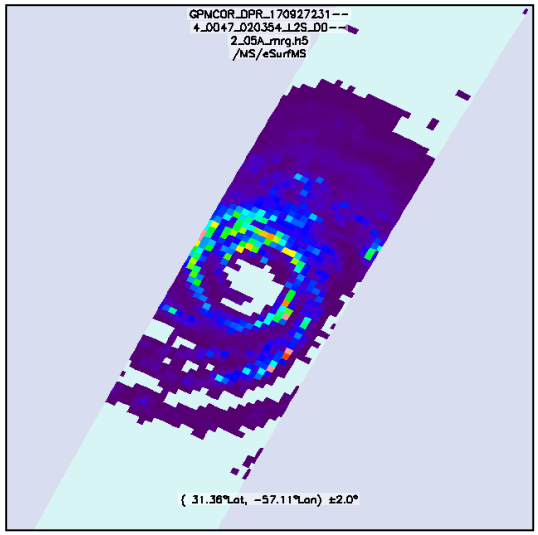
DPR L2 : precipRateESurface ***The current L2 algorithm is still in development phase.***

[mm/h]

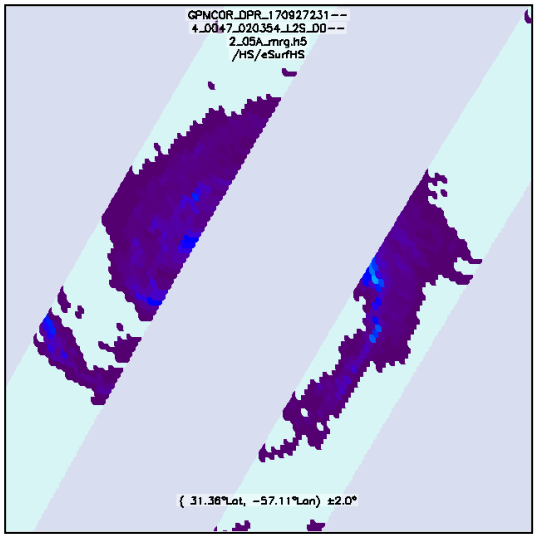
KuPR

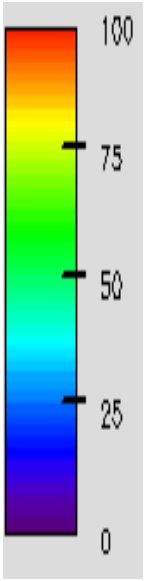


KaPR(MS)

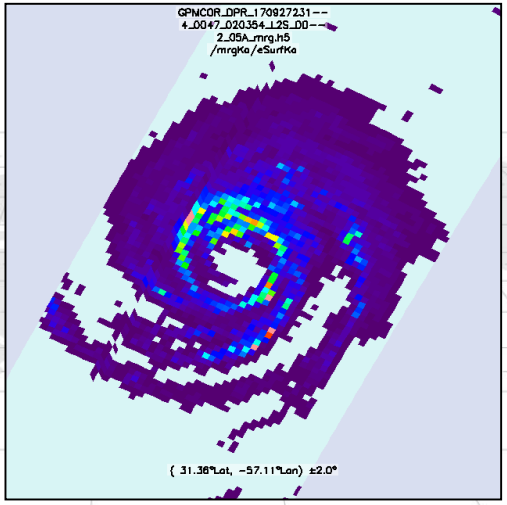


KaPR(HS)





KaPR(MS/HS)



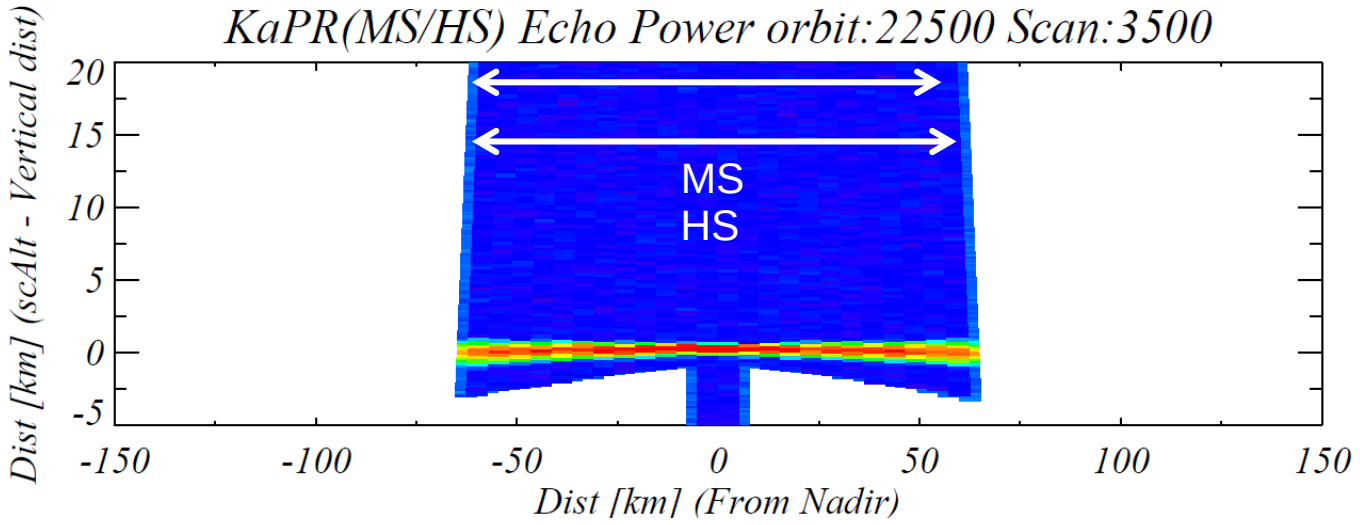
Sep 27th 2017
Hurricane LEE

Dual-frequency technique
will be applied in a full swath.

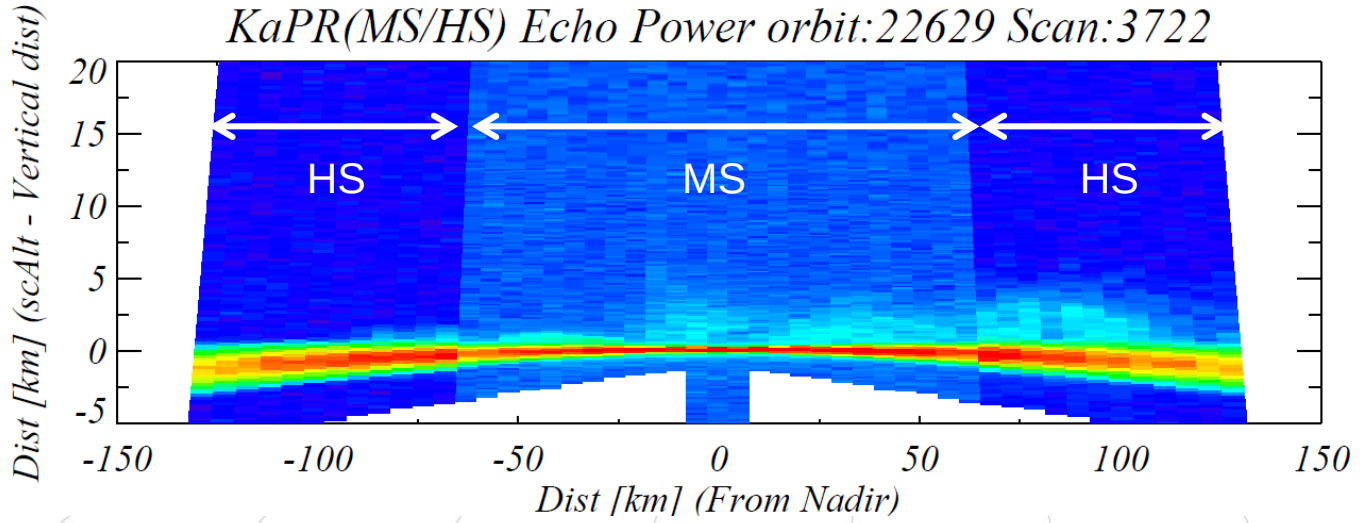
Experiment results for item A (2)

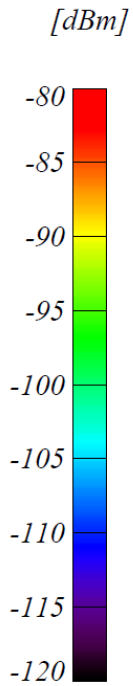
- Hardware setting were working as expected.

Current



EXP

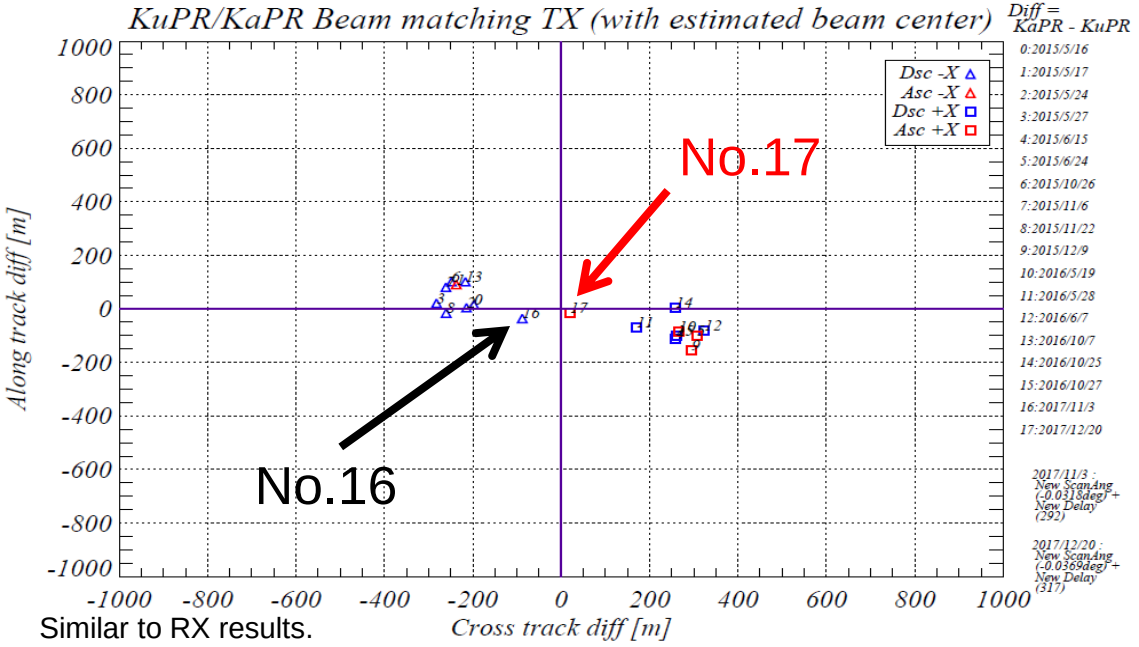




Experiment results for item B

- We confirmed the improvement of beam matching between KuPR and KaMS by the changes of the KaMS scan.

Item	NOW	EXP (FEB 2018)
Beam matching between KuPR NS and KaPR MS	Approx. 300m	Approx. 30m



Similar to RX results.

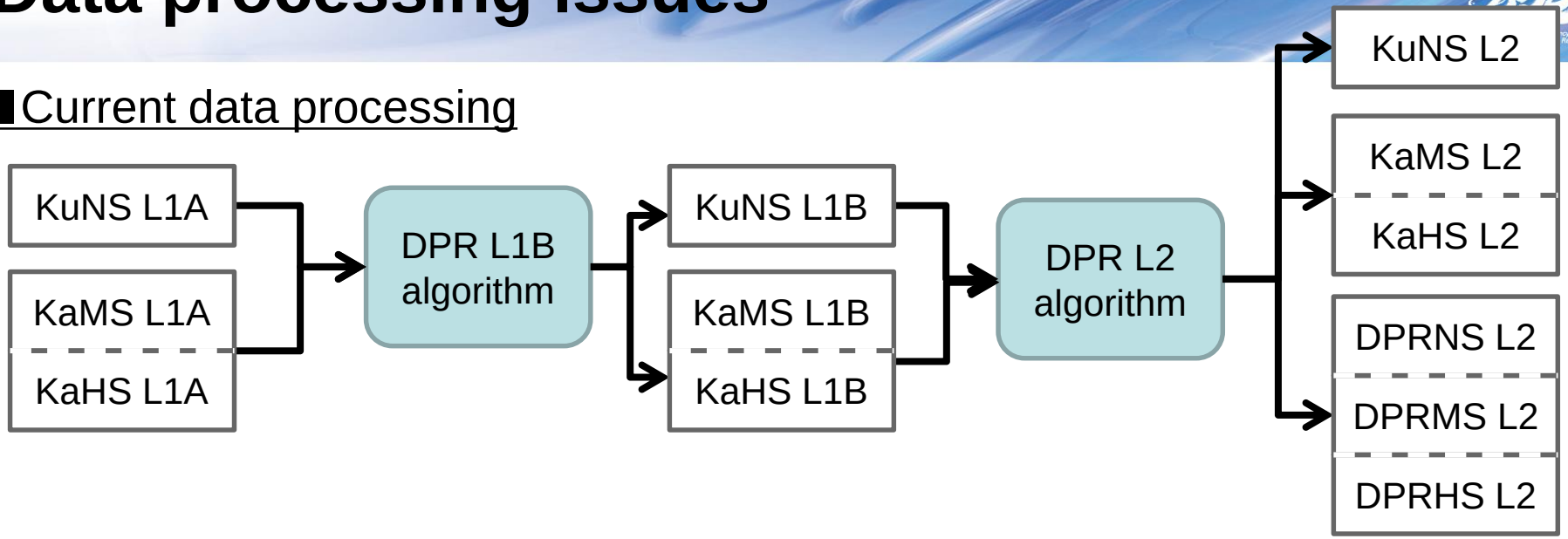
- JAXA conducted external calibration to confirm the improvement of beam matching.
- 'No.16' and 'No.17' shows the result of external calibration with parameters which was applied in Sep test and in Feb test, respectively. A distance between KuPR and KaPR was approx. 100m and approx. 30m, respectively.
- New parameters tend to improve the beam matching.

Brief summary for KaPR scan pattern change

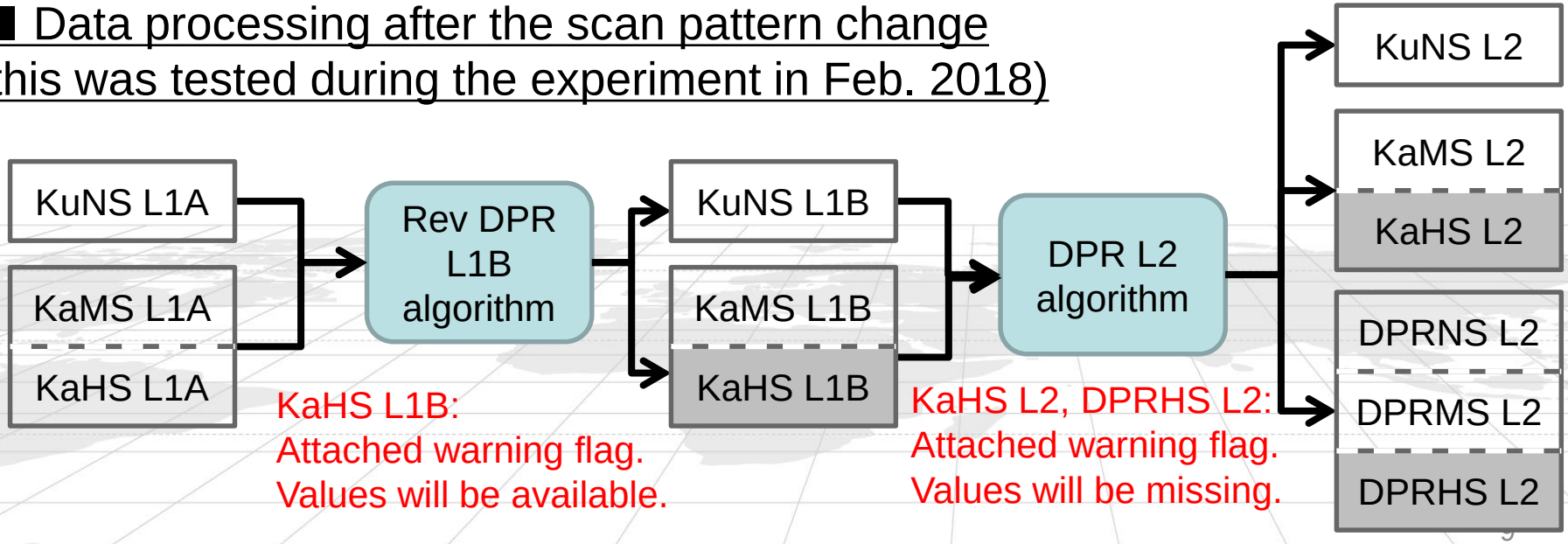
- Advantages
  - By the change of the KaHS scan pattern, the dual-frequency technique will be applied in a full swath.
  - The beam matching between KuPR and KaMS will be improved by the changes of the KaMS scan.
- Remaining issues
  - Need to modify L2 algorithms for Ka full swath retrievals.
  - There is a possible discontinuity of signals between the MS and the HS at the boundary.
    - Due to differences of sensitivities (18dBZ vs 12dBZ) , in addition to vertical resolutions (250m vs 500m).
      - Actually, higher sensitivity in the HS will be able to cause the discontinuity of the precipitation pattern in the Ka full scan.
    - We need to take these into a consideration in the format change and the L2 algorithm development.

Data processing issues

■Current data processing



■ Data processing after the scan pattern change (this was tested during the experiment in Feb. 2018)



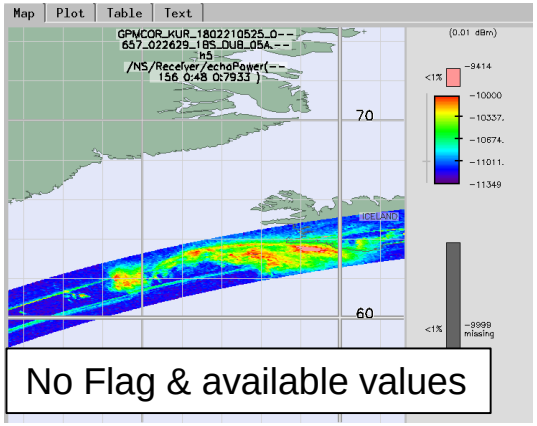
Experiment results

DPR L1/L2 algorithms can fill the HS part to warning flags and/or missing after the scan pattern change.

Feb 21, 2018 at 05Z (Orbit 22629)

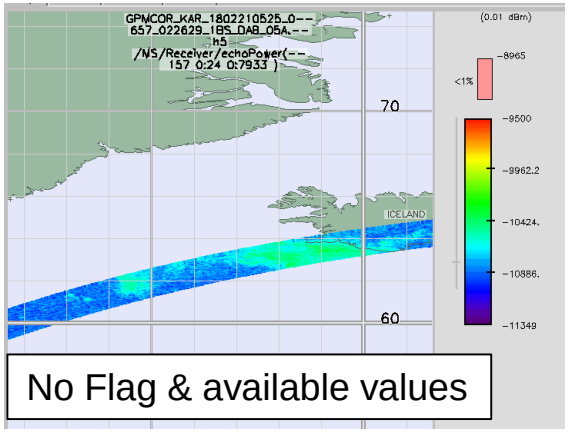
DPR L1 : echo power

KuNS



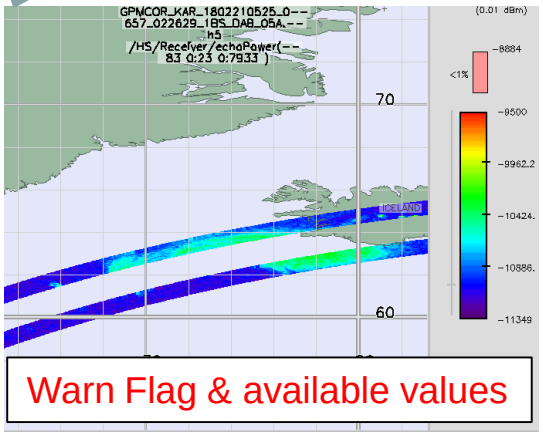
No Flag & available values

KaMS



No Flag & available values

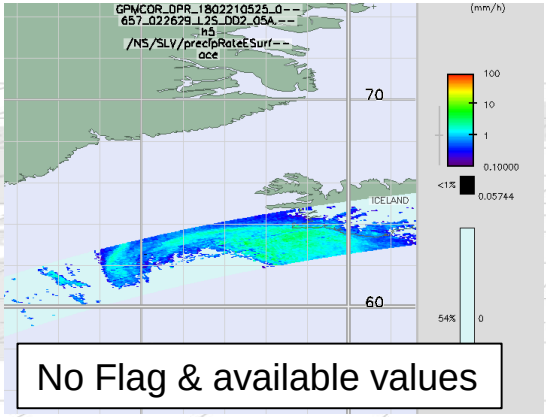
KaHS



Warn Flag & available values

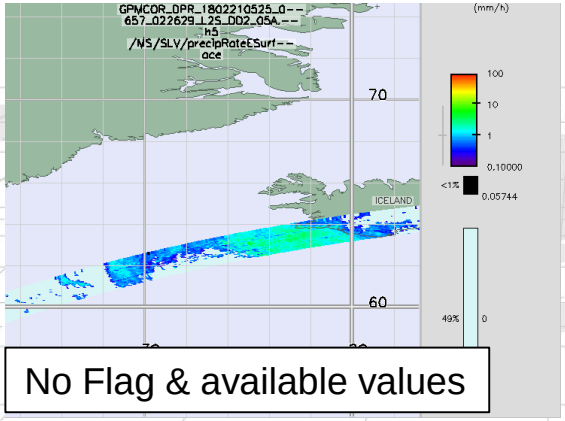
DPR L2 : precipRateESurface

DPR/NS



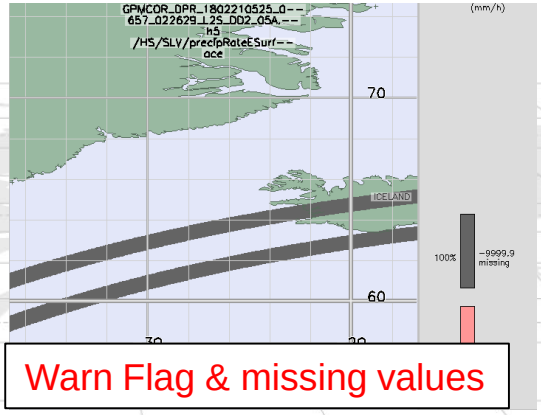
No Flag & available values

DPR/MS



No Flag & available values

DPR/HS



Warn Flag & missing values

A tentative schedule of the product release for the KaPR full swath data to the scientific community

A proposed schedule

- Target: December 2019 (TBD)
- Assumption
  - L2 Code submission to the PPS and SAOC: end of August 2019
    - *Format discussions: Sep. 2018*
    - *The code preparation including the PRE: end of Dec. 2018*
    - *Module submission: end of July 2019*
    - *Integration & evaluations: August 2019*
  - COMB Code submission: end of September 2019
  - JPST: Beginning of November 2019
- We’re also planning "for algorithm developers" only version for implementing and testing the full swath retrieval algorithms in the PPS during 2018-2019 time slot.

Summary

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