Changes of PR Version 6 Products

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List of Changes of 1B21 and 1C21 Version 6

(1) 1B21

- Minor changes are done in calibration table. New table has smoother change between linear part and parabolic part. Lower non-linear part is replaced by linear curve.
- Receiver Calibration coefficient is changed form –0.65 to -0.99.
- BinSurfPeak detection algorithm is modified.
  - BinSurfPeak is re-calculated for the cases that surface peak is masked by strong rain attenuation.
  - In order to distinguish this case from ordinary cases, new LWFlag (LandOceanFlag) is added as follows:
    - --- LWFlag = 3 (Ocean w/ attenuation)
    - --- LWFlag = 4 (Land w/ attenuation)
    - --- LWFlag = 5 (Coast w/ attenuation)

(2) 1C21: No change

List of Changes of 2A21 Version 6

- Implement hybrid surface reference over ocean
- Change in angle bin definition

  - In previous versions extent of angle bin was taken to be equal to the size of the cross-track beamwidth
  - But cross-track beamwidth is a function of inc. angle
  - In present version, angle bin is fixed at 0.75^0
  - Counts in angle bins now are more uniform than in v5

- Use of scOrientation parameter

  - In previous versions, right & left-hand sides of swath were not correctly distinguished
  - This effectively mixed the surface reference data from right & left hand sides
  - scOrientation parameter is now used to separate right & left-hand sides of swath

List of Changes of 2A23 Version 6

- Rain type flag: 2 digits→3 digits
- Changed criteria for other type, whose count decreases in V6
- All the shallow isolated is convective
- Introduced Shallow non-isolated
- Changed BB detection code, allowing Z below BB can be larger than Z at BB peak.
- When BB is detected, rain type is stratiform
- Introduced BB boundaries and BB width
- Introduced rain probable (no effect on other products)

List of Changes of 2A25 Version 6

- Removal of the 4 known bugs
  - Bias of half range in the bright-band height.
  - Errors in the table of height dependence of rain drop falling speed.
  - Error in the equation for correcting the non-uniform beam filling (NUBF) effect.
  - Error in the formula to calculate the error of the path-integrated attenuation (PIA).
- Improvement of estimation of rain rate in the range that is cluttered by the surface echo.
- Outputting the statistical expectations of rainfall rate ***R*** and radar reflectivity factor ***Z*** by using Bayesian method.

List of Changes of 2A25 Version 6

- Addition and modification of output variables

  - Interval of integration of rain rate (now from top of the storm to the surface)
  - Outputting ε_0 instead of the weight in the hybrid surface reference method.
  - Vertical accumulation (column content) of precipitation water content from the top of storm to the surface, and its values at 5 nodal points.

- Removal of unrealistically large values of ***Z*** and ***R*** due to graupel or hail.
- Effect of gaseous attenuation
- Initial DSD model
- Adjustment of initial error estimates in ζ and $\Delta\sigma^0$

3A25 Version 6 : New Products in 3A25

- Nadir bright-band products (from 2A23)
  - --- Height of BB --- Width of BB --- Maximum Z value within BB
- Estimated surface rain rate (from 2A25)
  - --- Includes low and high resolutions --- Includes statistics conditioned on rain type
- Near surface rain rate (from 2A25)
  - --- Unconditioned statistics already defined in version 5
  - --- Add conditional statistics
- a, b parameters in $R=aZ^b$ relationship (derived from 2A25)
  - --- Coefficients derived from regression line fit through pairs of (logZ, logR) points
  - --- Low and high resolution --- Conditioned on rain type
  - --- Heights: near-surface and 2 km
- New rain categories (from 2A23)
  - --- Isolated shallow, low & high res --- Non-isolated shallow, low & high res
  - --- (note that low & high resolution products include counts & mean, std dev of RR; histogram computed only for low res. products)
- ε, ε_0 statistics
  - --- Conditioned on strat/conv only (exclude all-rain conditioning)
  - --- Low and high resolution
  - --- Statistics should be taken over same subset of data, but
    - Reliable/marginally reliable subset from 2A21 (present procedure) ?
    - Use more stringent filter of data from 2A25 ?

3A25 Version 6

Other additions and Changes

- Pia statistics
  - Pia's for V5 included data at angles at 0, 5, 10, 15 degrees
  - Add 5th category that includes pia's from all angles
  - Pia's for angles 0, 5, 10, 15 degrees now include data from both right- and left-hand sides of swath

- Add counts for
  - Correlation of RR at several height levels
    - --- Count only those cases where RR's at both heights are > 0
  - Number of reliable/marginally reliable SRT observations