

## 1. Introduction

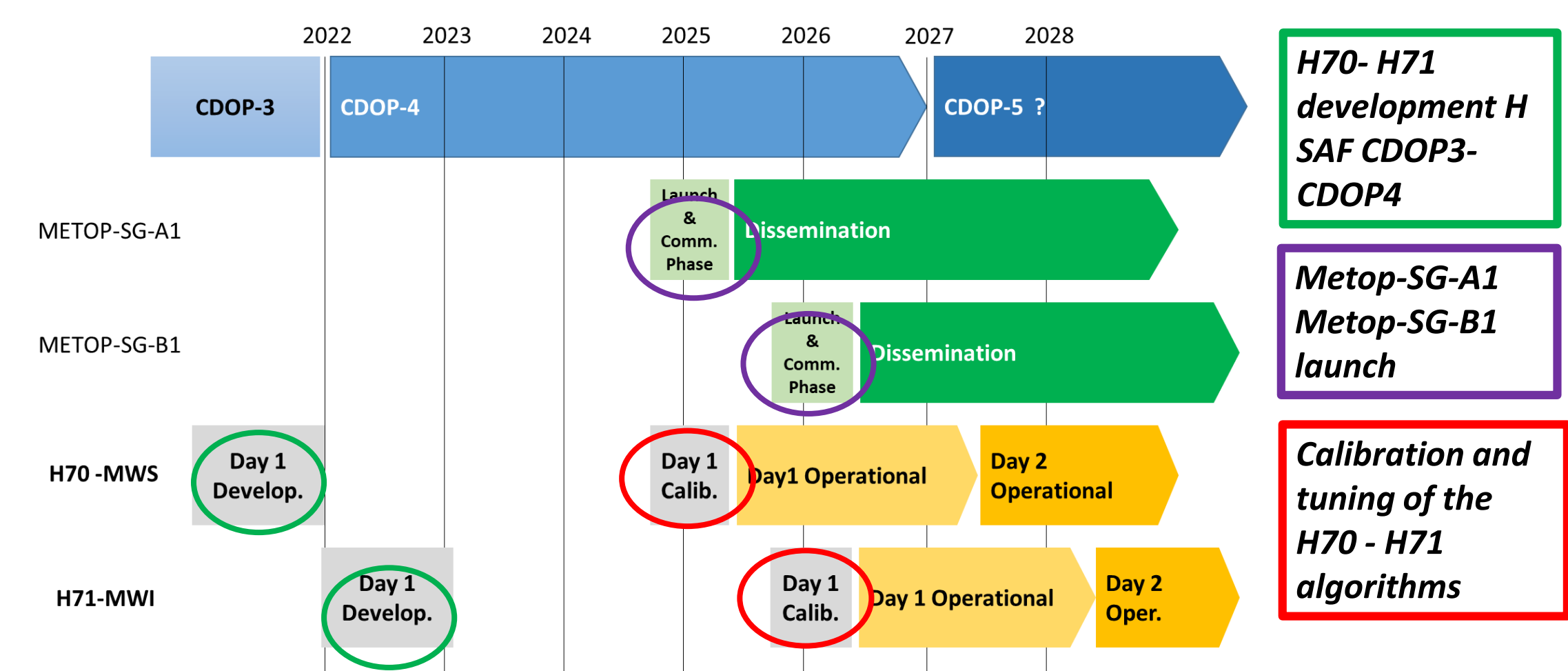
### H SAF Goals:

- to provide satellite-derived products from existing and future satellites with sufficient time and space resolution to satisfy the needs of operational hydrology; identified products:
  - precipitation (liquid, solid, rate, accumulated);
  - soil moisture (at large-scale, at local-scale, at surface, in the roots region);
  - snow parameters (detection, cover, melting conditions, water equivalent);
- to perform independent validation of the products and evaluate their contribution in operational hydrology.

### H SAF P-IN-MWS/MWI (H70/H71)

#### Precipitation Product by EPS-SG MWS/MWI

- Level 2 products providing **instantaneous precipitation rate**, on a **global scale**, from the EPS-SG MWS – MWI brightness temperatures.
- Designed as the **Day 1 operational precipitation product** for the Metop-SG series (A&B), include **different modules** specifically designed for the detection and estimate of **rainfall and snowfall**.
- Developed using the **ATMS cross-track radiometer and the GMI conical scanning radiometer**, similar in terms of channel frequencies and spatial resolution to MWS and MWI, respectively.
- Different modules are based on **machine learning approach trained using GPM-CO and CloudSat spaceborne radar precipitation products as reference**



## 2. Training Dataset

The two datasets are built from coincident (in space and time) observations of spaceborne cloud and precipitation radars and GPM GMI (or ATMS) brightness temperatures averaged to match MWI (or MWS) spatial resolution.

**The GPM Dual-frequency Precipitation Radar (DPR) is used as reference to develop the rainfall modules.**

**The Cloud Profiling Radar (CPR) is used for snowfall modules**

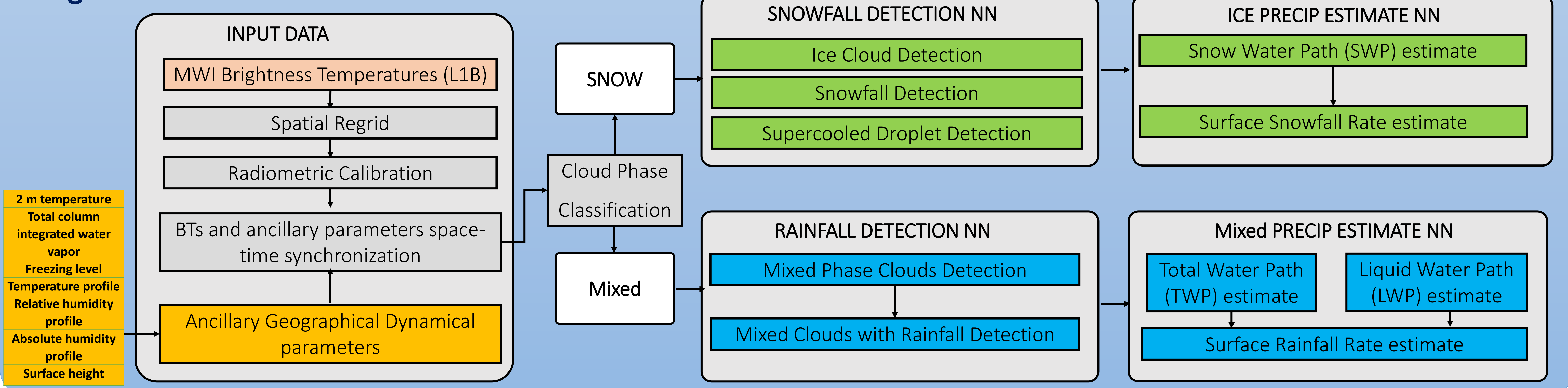
The dataset has been used for training and test of the Neural Networks modules

ATMS and MWS Characteristics			
Advanced Technology Microwave Sounder (ATMS)		EPS-SG Micro-Wave Sounder (MWS)	
Central freq. (GHz)	Pol.	Central freq. (GHz)	Pol.
23.8	QV	23.8	QH
31.4	QV	31.4	QH
50.3	QH	50.3	QH/QV
51.7	QH		
52.8	QH	52.800	QH/QV
		53.246±0.08	QH/QV
53.6	QH	53.6	QH/QV
		53.948±0.081	QH/QV
54.4-57.3 (9 ch)	QH	54.4-57.3 (9 ch)	QH/QV
89.5	QV	89	QV
165.5	QH	165	QH
183.3 (5 ch)	QH	183.3 (5 ch)	QV
		229.0	QV

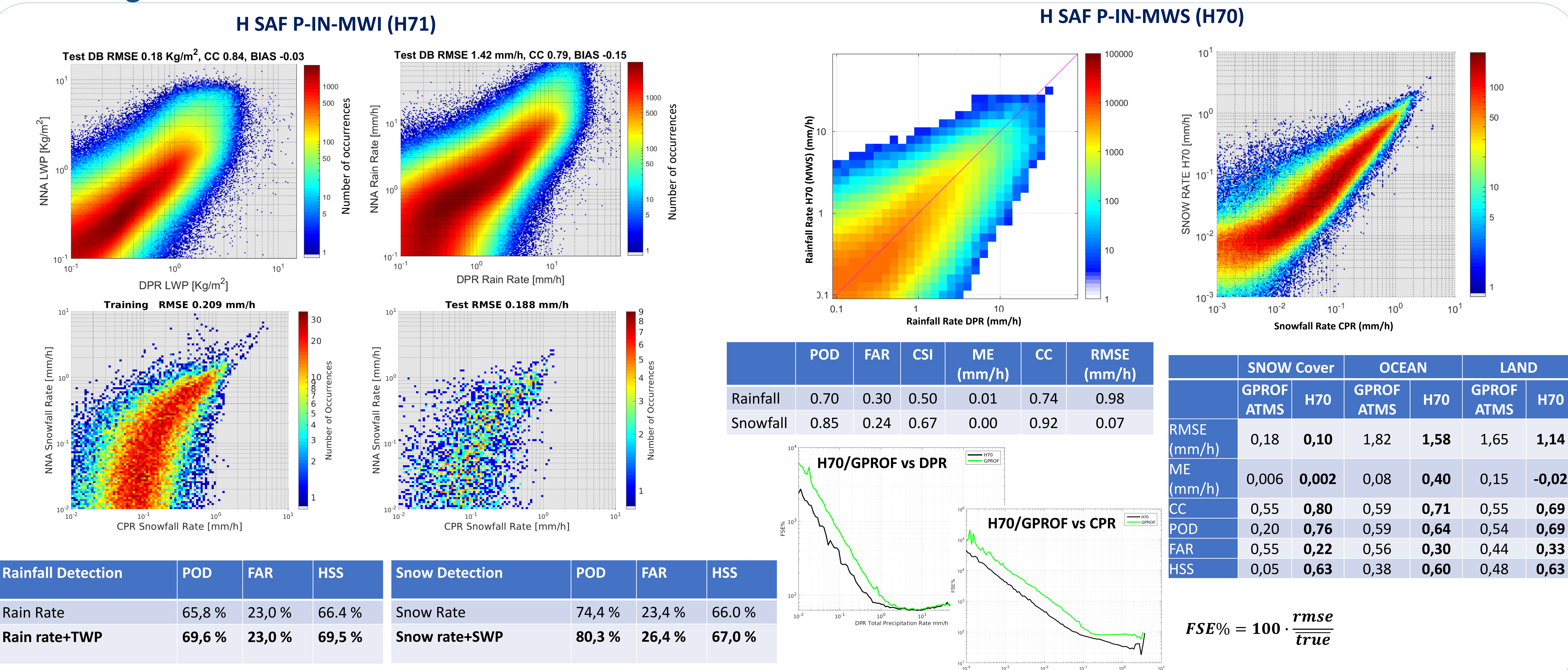
GMI and MWI Characteristics					
GPM Microwave Imager (GMI)			EPS-SG Micro-Wave Imager (MWI)		
Central freq. (GHz)	Pol.	IFOV (km)	Central freq. (GHz)	Pol.	IFOV (km)
10.65	V,H	19x32			
18.7	V,H	11x18	18.7	V, H	50
23.8	V	9.2x15	23.8	V, H	50
36.5	V,H	8.6x14	31.4	V, H	30
			50.-60. Band	V, H	30
89.0	V,H	8.6x14	89.0	V, H	10
			118.75 Band	V	10
166.5	V,H	4.4x7.2	165.5±0.725	V	10
183.31 ± 7	V	4.4x7.2	183.31±7.0	V	10
			183.31±6.1	V	10
			183.31±4.9	V	10
183.31 ± 3	V	4.4x7.2	183.31±3.4	V	10
			183.31±2.0	V	10

Period	CPR-GMI		DPR-GMI		CPR-ATMS		DPR-ATMS	
	2014-2016	2015	2014-2016	2015	2014-2016	2014-2016	2014-2016	2014-2016
Geographical area	Global	Global (up to 65° lat)	Global	Global (up to 65° lat)	Global	Global (up to 65° lat)	Global	Global (up to 65° lat)
dataset size	250 k	300 M	2.2 M	15 M				
Training/Test	90%/10%	50%/50%	30%/60%	30%/60%				
Reference Rainfall product	2C-SNOW-PROFILE	2B-CMB V07A Ku (NS)	2C-SNOW-PROFILE	2B-CMB V07A Ku (NS)				
Time window	Within 15 minutes	Almost simultaneous	Within 15 minutes	Within 15 minutes				
Spatial Resolution	CPR and DPR averaged to 10x10 km pixel		CPR and DPR averaged to match ATMS (90 GHz) resolution 15.8 x 15.8 (nadir) 30 x 68.4 (scan edge)					

## 3. Algorithm Flowchart



## 4. Training and Test Results



## 5. Future developments

- Future activities for the MWI day-1 algorithm**
- During the commissioning phase a calibration-tuning procedure between MWI/MWS and GMI/ATMS channels will be carried out.
  - Test of optimal regridding strategy of MWI channels.
  - An extensive validation will be carried out a global scale to confirm the algorithms performance.

## 6. References

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