Satellite Soil Moisture Validation and Application Workshop
19-20 September 2017, Vienna University of Technology (TUWien), Vienna, Austria

Global Soil Moisture Monitoring with Sentinel-1: Required Data Processing and Analysis Capabilities

19.09.2017 Poster Session 15:30 – 17:30

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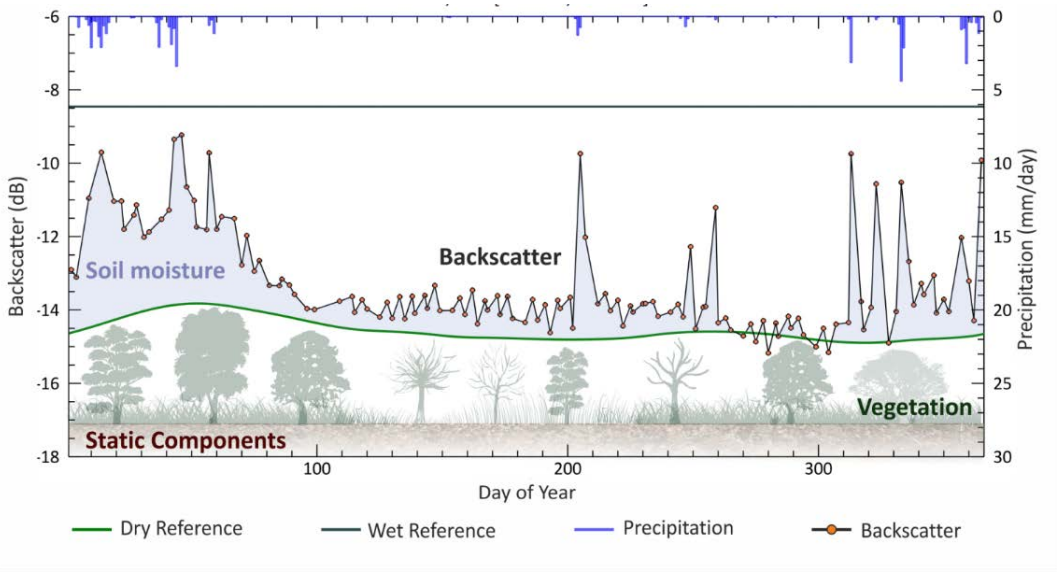
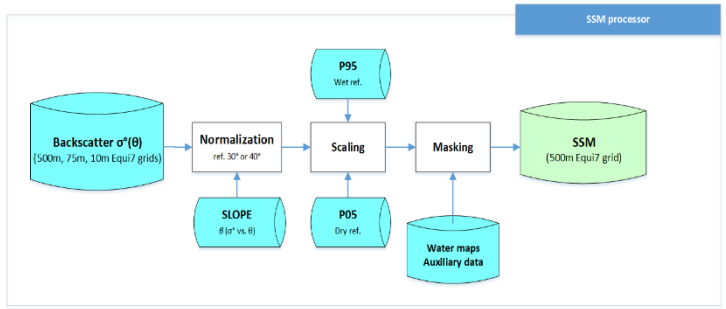
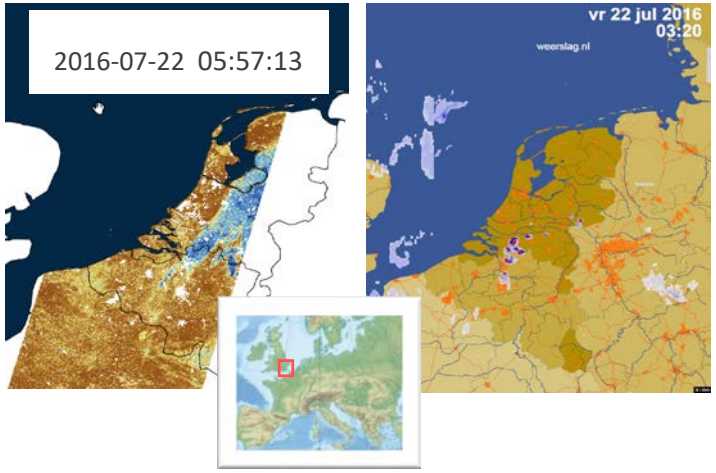
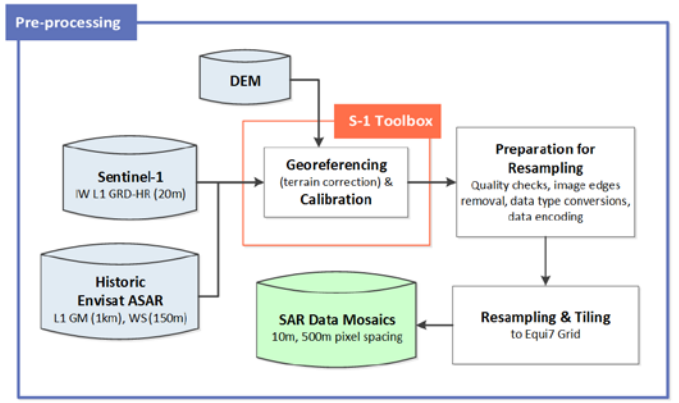
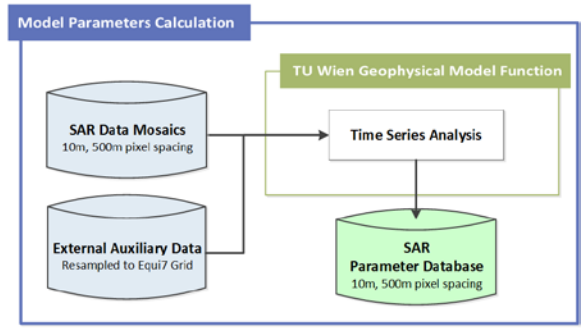
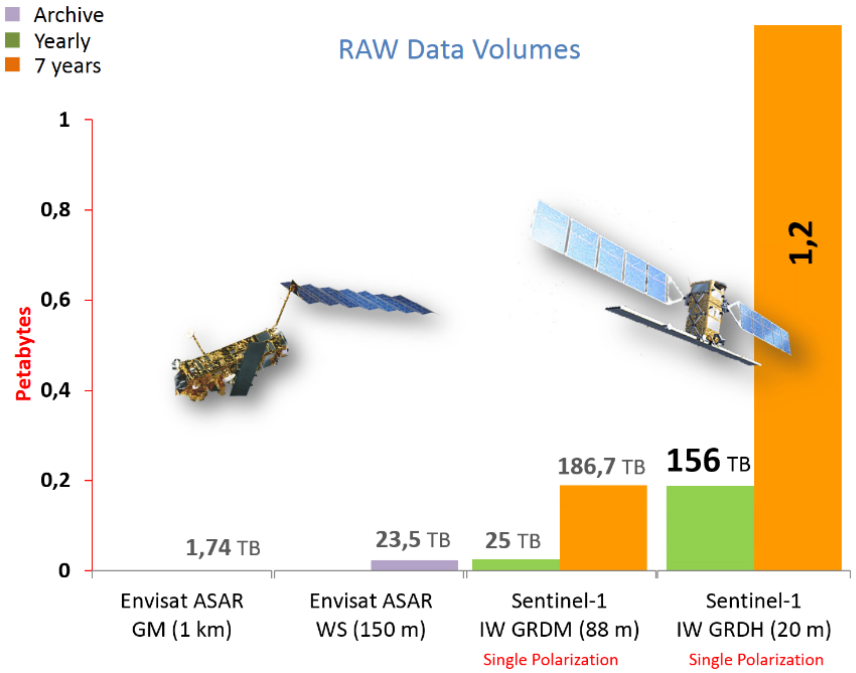

Backscatter (dB)
Precipitation (mm/day)
Soil moisture
Backscatter
Vegetation
Static Components
Day of Year
Dry Reference
Wet Reference
Precipitation
Backscatter

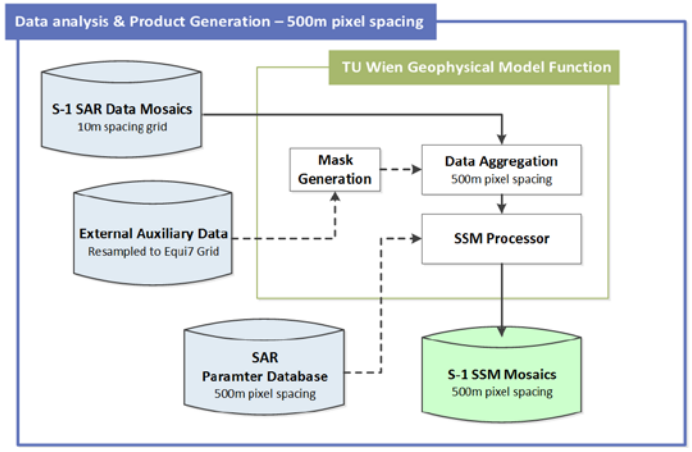

SSM processor
Backscatter σ°(θ)
(500m, 75m, 10m Equi7 grids)
Normalization
ref. 30° or 40°
SLOPE
P95
Wet ref.
P05
Dry ref.
Scaling
Masking
Water maps
Auxiliary data
SSM
(500m Equi7 grid)

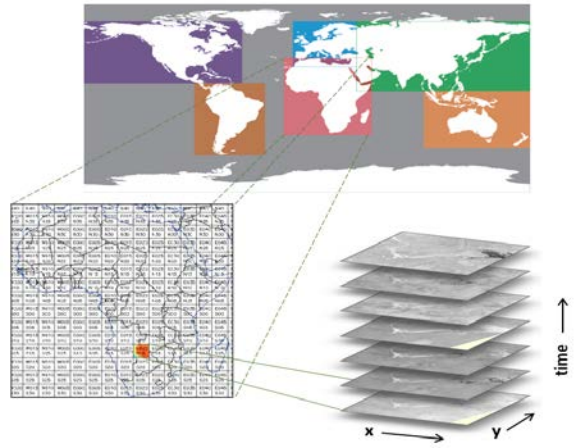

2016-07-22 05:57:13
vr 22 jul 2016
03:20
weerslag.nl

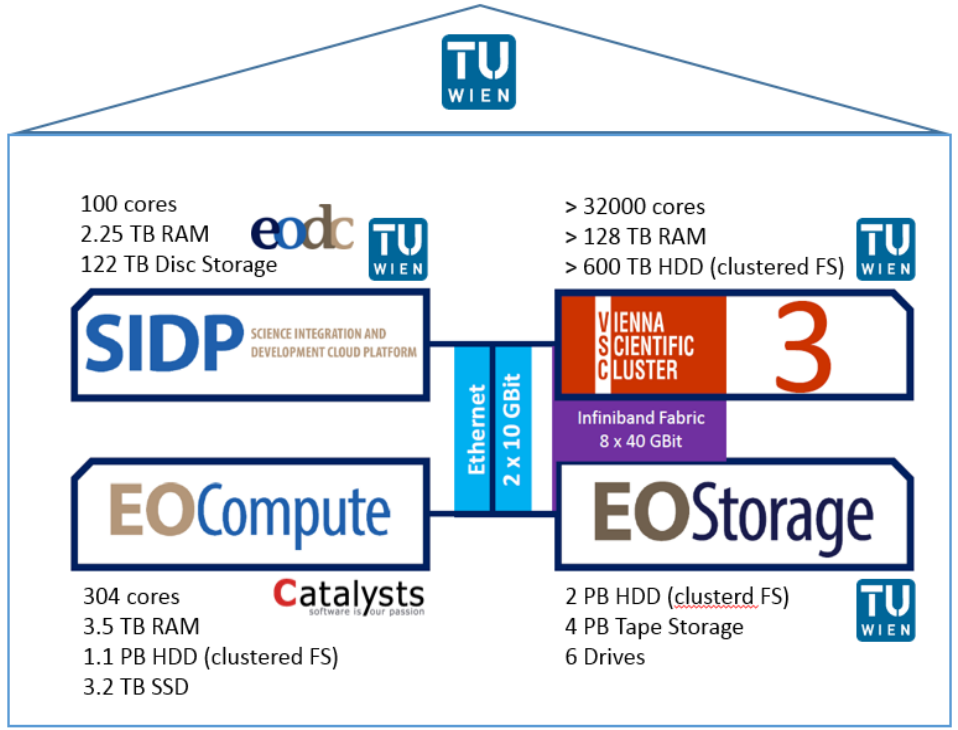

Pre-processing
DEM
S-1 Toolbox
Sentinel-1
IW L1 GRD-HR (20m)
Georeferencing
(terrain correction) &
Calibration
Preparation for
Resampling
Quality checks, image edges
removal, data type conversions,
data encoding
Historic
Envisat ASAR
L1 GM (1km), WS (150m)
SAR Data Mosaics
10m, 500m pixel spacing
Resampling & Tiling
to Equi7 Grid

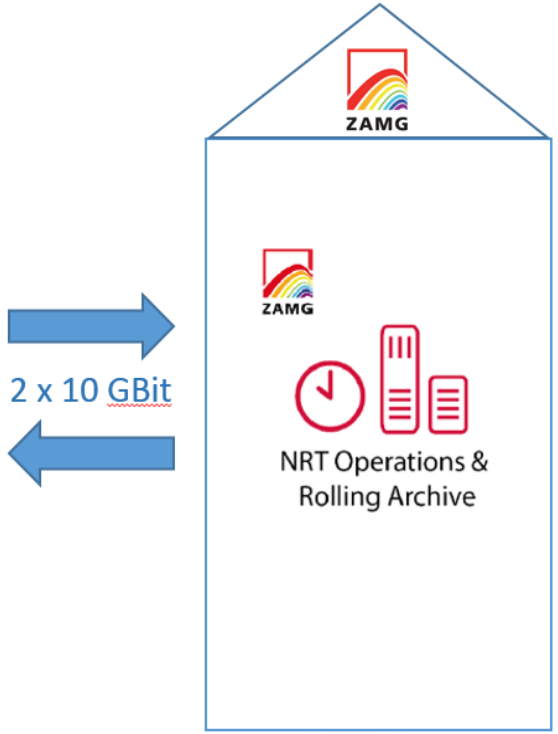

Model Parameters Calculation
TU Wien Geophysical Model Function
SAR Data Mosaics
10m, 500m pixel spacing
Time Series Analysis
External Auxiliary Data
Resampled to Equi7 Grid
SAR
Parameter Database
10m, 500m pixel spacing

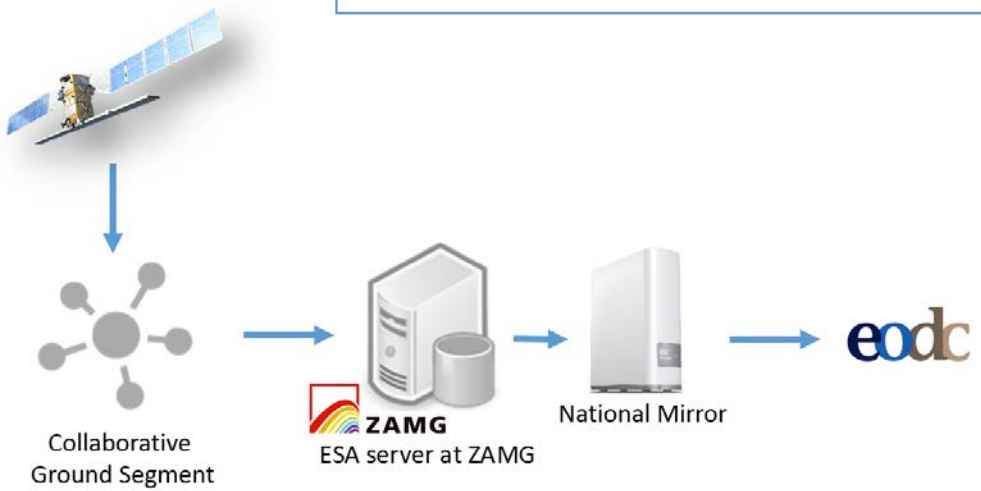

Archive
Yearly
7 years
RAW Data Volumes
Petabytes
1
0,8
0,6
0,4
0,2
0
1,74 TB
23,5 TB
25 TB
186,7 TB
156 TB
1,2
Envisat ASAR
GM (1 km)
Envisat ASAR
WS (150 m)
Sentinel-1
IW GRDM (88 m)
Single Polarization
Sentinel-1
IW GRDH (20 m)
Single Polarization

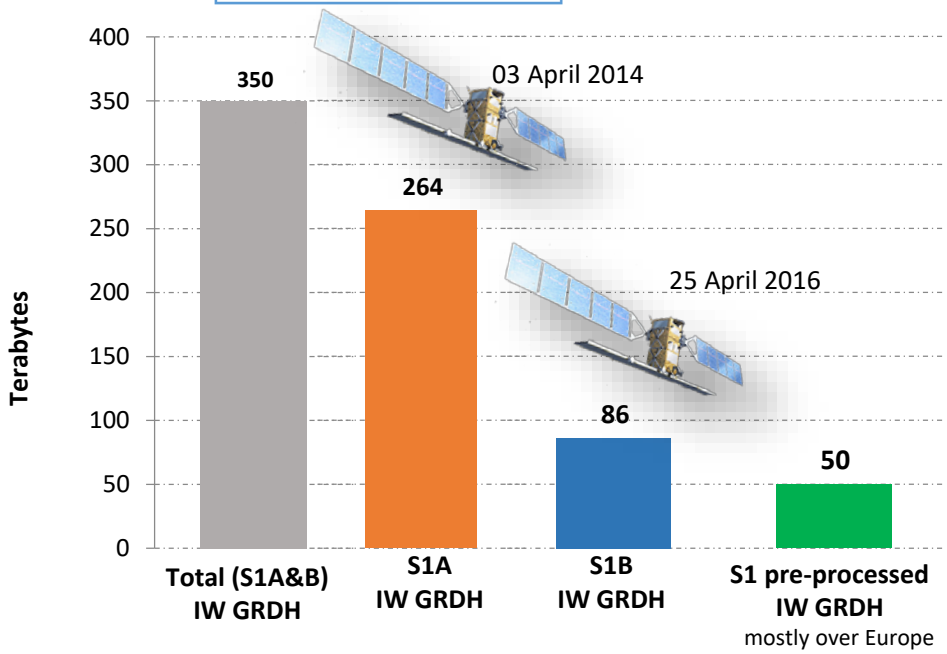

Data analysis & Product Generation – 500m pixel spacing
TU Wien Geophysical Model Function
S-1 SAR Data Mosaics
10m spacing grid
Mask
Generation
Data Aggregation
500m pixel spacing
External Auxiliary Data
Resampled to Equi7 Grid
SSM Processor
SAR
Paramter Database
500m pixel spacing
S-1 SSM Mosaics
500m pixel spacing


time
x
y


TU WIEN
100 cores
2.25 TB RAM
122 TB Disc Storage
eodc
TU WIEN
SIDP
SCIENCE INTEGRATION AND DEVELOPMENT CLOUD PLATFORM
Ethernet
2 x 10 GBit
VIENNA SCIENTIFIC CLUSTER 3
> 32000 cores
> 128 TB RAM
> 600 TB HDD (clustered FS)
TU WIEN
Infiniband Fabric
8 x 40 GBit
EOCompute
EOStorage
Catalysts
304 cores
3.5 TB RAM
1.1 PB HDD (clustered FS)
3.2 TB SSD
2 PB HDD (clusterd FS)
4 PB Tape Storage
6 Drives
TU WIEN


ZAMG
2 x 10 GBit
ZAMG
NRT Operations &
Rolling Archive


Collaborative
Ground Segment
ZAMG
ESA server at ZAMG
National Mirror
eodc


Terabytes
400
350
300
250
200
150
100
50
0
350
264
86
50
03 April 2014
25 April 2016
Total (S1A&B)
IW GRDH
S1A
IW GRDH
S1B
IW GRDH
S1 pre-processed
IW GRDH
mostly over Europe

S-1 IW GRDH data volume and required processing effort

	Global	*Europe*
Monthly data volume (10m grid)	15.546 TB (~15.5 TB)	3.976 TB (~4TB)
Preprocessing time (~2 seconds/MB) per month	9,056.2 hrs (~377.3 days)	2,316.2 hrs (~96.5 days)
Monthly preprocessed data volume (max: 2.5 x raw data)	38.865 TB (~39TB)	9.94 TB (~10 TB)
Automatic quality check per month	93.2 hrs (3.8 days)	23.8 hrs (~1 day)
Parameter Retrieval per month	1378.8 hrs (~57.5 days)	352.6 hrs (~14.7 days)
Soil moisture retrieval (500m) per month	391.7 hrs (~39.1days)	100.2 hrs (~4.2 days)
Total processing time per month	~479 days	~118 days
Total storage size required per year	(15.5+39) X 12 = ~654 TB	(4+10) x 12 =~168TB
Total number of required node hours per day	16 nodes	4 nodes

Note: only data processing hours are considered. The reprocessing time and man power for running/checking/managing the process are not included..