ILMATIETEEN LAITOS
METEOROLOGISKA INSTITUTET
FINNISH METEOROLOGICAL INSTITUTE

SEVENTH FRAMEWORK PROGRAMME

PROCESSING LINES AND OPERATIONAL SERVICES COMBINING SENTINEL AND IN-SITU DATA FOR TERRESTRIAL CRYOSPHERE AND BOREAL FOREST ZONE

SEN3APP

PROJECT COORDINATION:

BUDGET INFO:

Total amount: 2,916,586 €

% EC Co-funding: 2,212,191 €

DURATION: Start: 01/12/13 - End: 01/12/16

PROJECT'S IMPLEMENTORS:

Coordinating Beneficiary: FMI

Associated Beneficiary(ies): SYKE, VTT, GAMMA , ENVEO

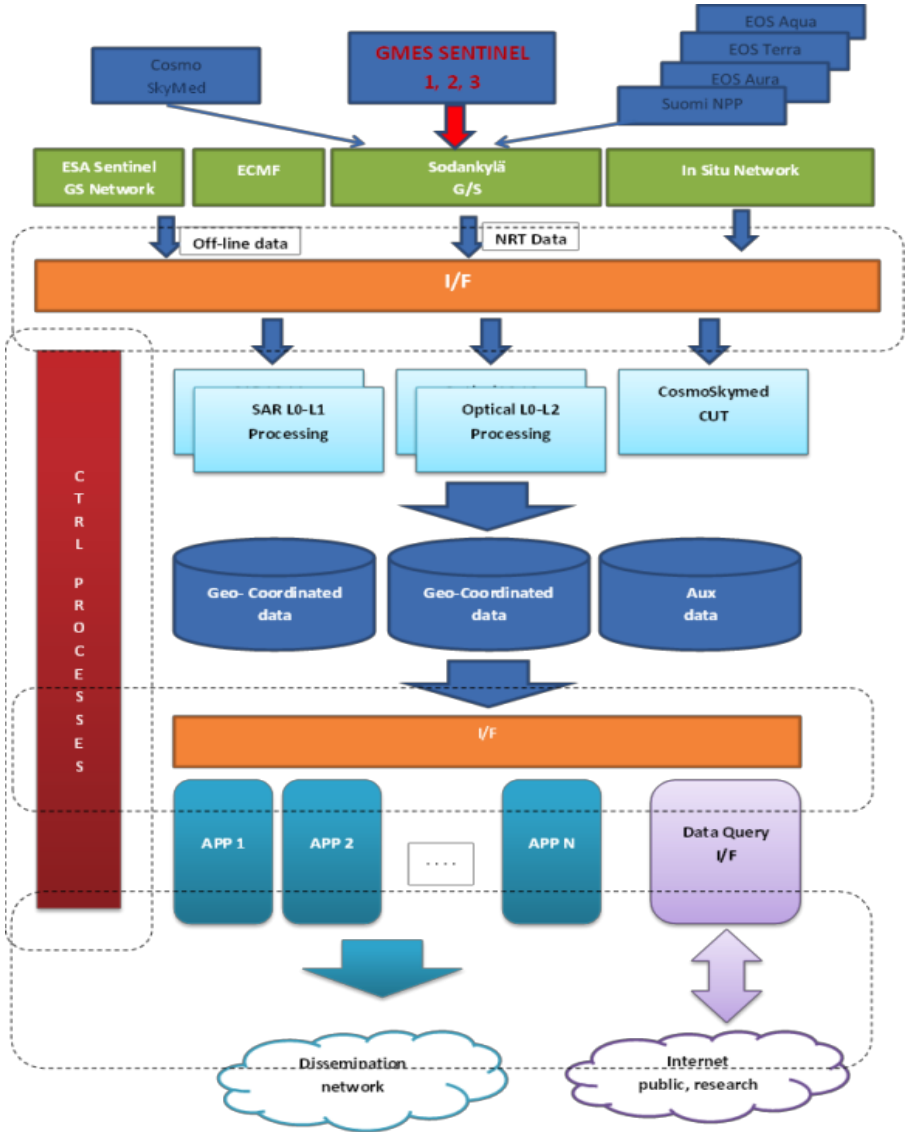
OBJECTIVES:

SEN3APP is concerned with the development, implementation, operationalization and validation of Sentinel data processing lines for cryospheric (terrestrial) and land cover/ phenology applications. Both global and regional applications are included, focusing to high latitudes of the Earth and other parts of the cryosphere:

- **Global and regional snow cover: snow water equivalent (swe), snow extent, snow melt line, fractional snow cover (FSCA), wet (melting) snow area**
- **Glaciers: extent, snow/ice maps, glacier displacement maps**
- **Water bodies including the mapping of extent of (seasonally varying) water areas and lake/ river ice processes**
- **Soil freezing and thawing processes (tundra, boreal forests, wetlands and alpine regions) and concurrent changes in forest vegetation**
- **Permafrost subsidence**
- **Intra-annual monitoring of ecosystem functioning, based on time-series of vegetation indices relevant in northern boreal zone**
- **Monitoring of inter-annual changes in land cover**
- **Intermediate products such as cloud-screened surface reflectance.**

The overall objective of the proposed project is to provide end-users with products and services relevant to:

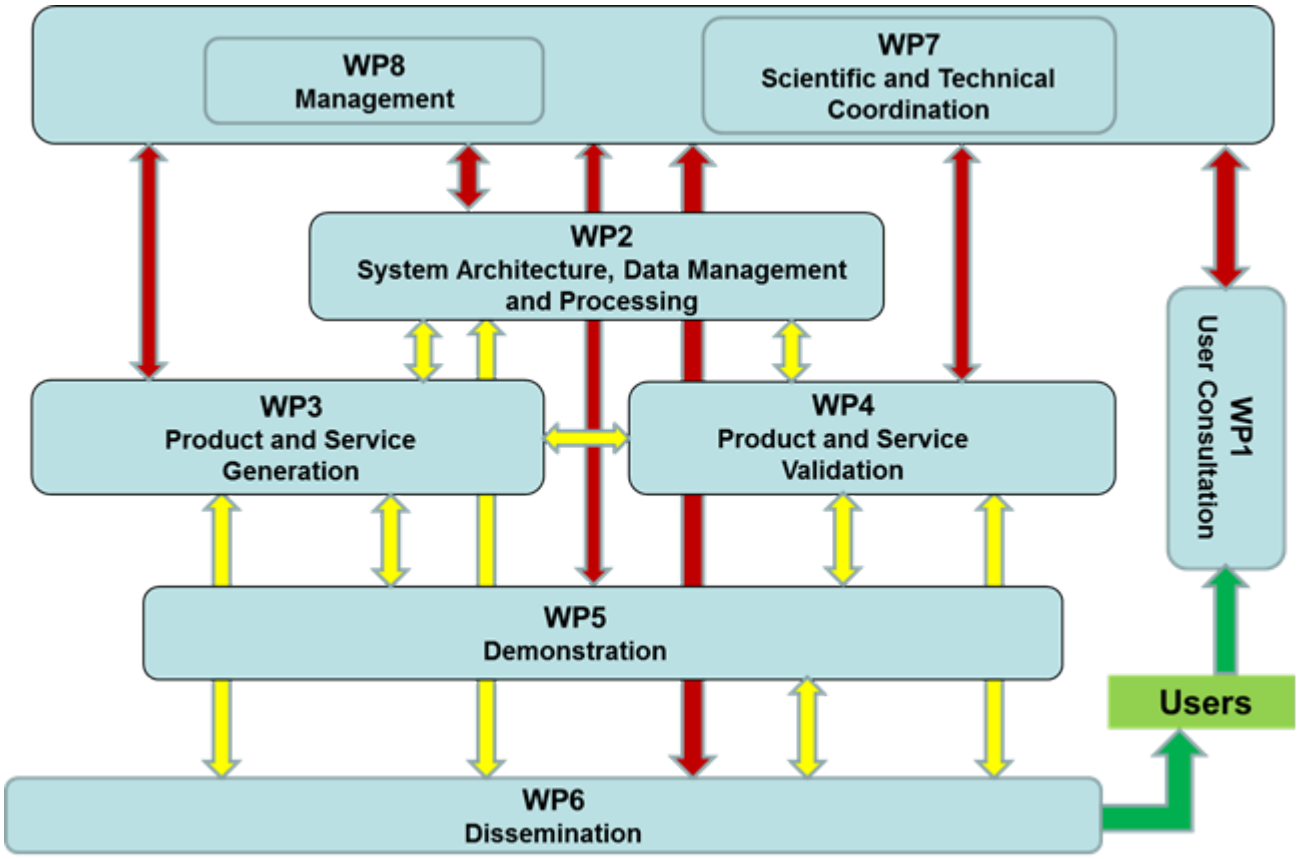
- ✓ Numerical Weather Prediction (NWP): land surface processes and albedo
- ✓ Local/regional scale climate change studies and planning of adaptation strategies
- ✓ Ecosystem studies & assessment of ecosystem services
- ✓ Evaluation of nutrient leaching caused by different land use and management practices for implementation of Water Framework directive objectives
- ✓ Hydrological forecasting and monitoring including hydro-power industry, flood prevention and water resources assessment
- ✓ Carbon balance monitoring and assessment
- ✓ Environmental monitoring including disasters, forest diseases and crop yield
- ✓ Construction and logistics as to soil frost and permafrost (roads, buildings, timber collection)

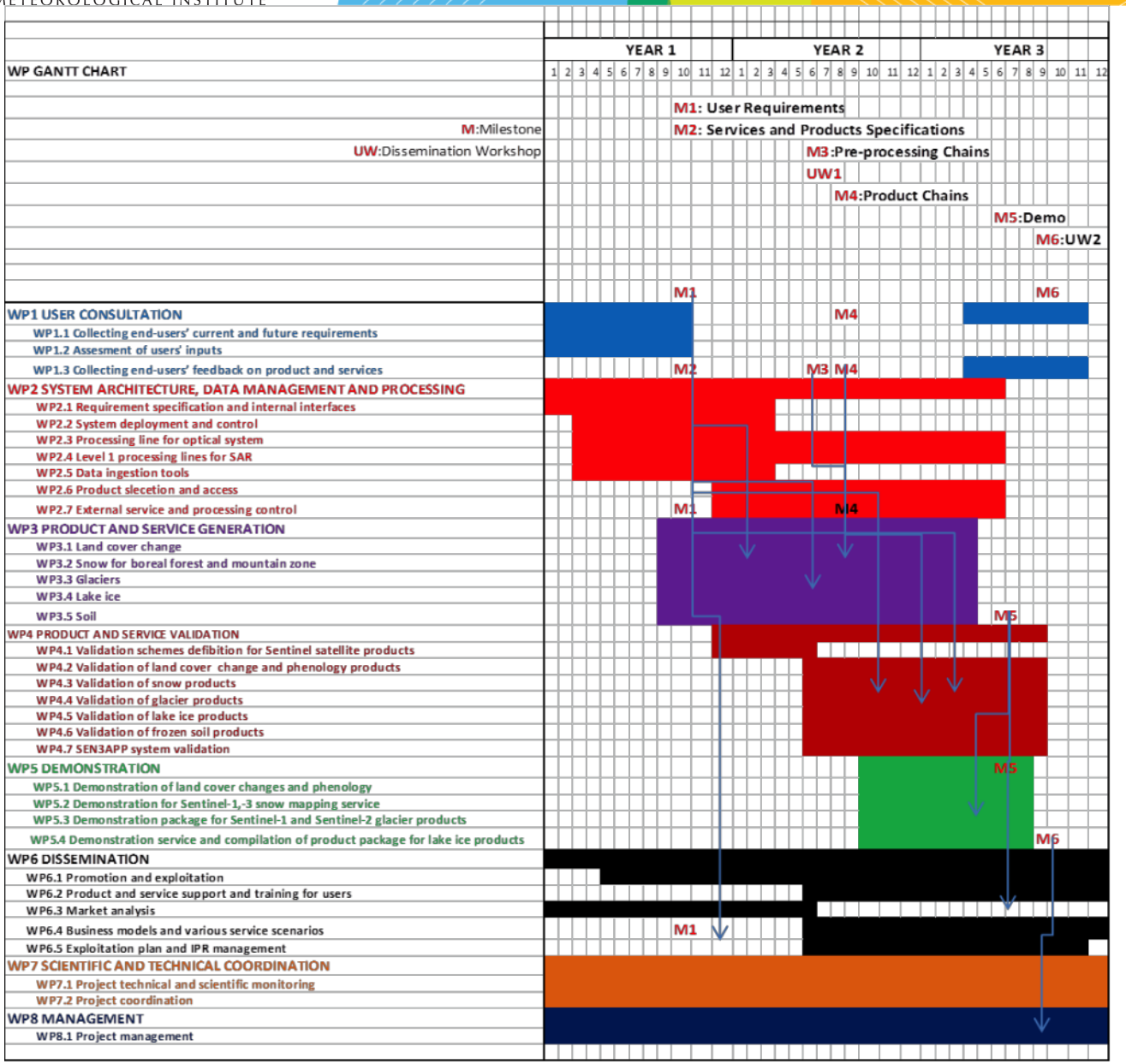


Proposed system structure for service provision including satellite and in situ data acquisition from various sources.

The direct data reception is carried out at the Sodankylä station which is part of the Sentinel collaborative ground segment

The SEN3APP work plan is organized as 8 interacting WPs, each of which are broken down into sub-WPs (= Tasks).




YEAR 1
YEAR 2
YEAR 3
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
WP GANTT CHART
M1: User Requirements
M2: Services and Products Specifications
M3:Pre-processing Chains
UW1
M4:Product Chains
M5:Demo
M6:UW2
M:Milestone
UW:Dissemination Workshop
WP1 USER CONSULTATION
WP1.1 Collecting end-users' current and future requirements
WP1.2 Assesment of users' inputs
WP1.3 Collecting end-users' feedback on product and services
WP2 SYSTEM ARCHITECTURE, DATA MANAGEMENT AND PROCESSING
WP2.1 Requirement specification and internal interfaces
WP2.2 System deployment and control
WP2.3 Processing line for optical system
WP2.4 Level 1 processing lines for SAR
WP2.5 Data ingestion tools
WP2.6 Product slecetion and access
WP2.7 External service and processing control
WP3 PRODUCT AND SERVICE GENERATION
WP3.1 Land cover change
WP3.2 Snow for boreal forest and mountain zone
WP3.3 Glaciers
WP3.4 Lake ice
WP3.5 Soil
WP4 PRODUCT AND SERVICE VALIDATION
WP4.1 Validation schemes defibition for Sentinel satellite products
WP4.2 Validation of land cover change and phenology products
WP4.3 Validation of snow products
WP4.4 Validation of glacier products
WP4.5 Validation of lake ice products
WP4.6 Validation of frozen soil products
WP4.7 SEN3APP system validation
WP5 DEMONSTRATION
WP5.1 Demonstration of land cover changes and phenology
WP5.2 Demonstration for Sentinel-1,-3 snow mapping service
WP5.3 Demonstration package for Sentinel-1 and Sentinel-2 glacier products
WP5.4 Demonstration service and compilation of product package for lake ice products
WP6 DISSEMINATION
WP6.1 Promotion and exploitation
WP6.2 Product and service support and training for users
WP6.3 Market analysis
WP6.4 Business models and various service scenarios
WP6.5 Exploitation plan and IPR management
WP7 SCIENTIFIC AND TECHNICAL COORDINATION
WP7.1 Project technical and scientific monitoring
WP7.2 Project coordination
WP8 MANAGEMENT
WP8.1 Project management
M1
M6
M4
M2
M3 M4
M1
M4
M5
M5
M6
M1

List of Products

Product/ Service	Service provider	Sensor	Projection/ Datum	Spatial coverage	Spatial resolution	Geometric accuracy	Temporal frequency	Yearly delivery time period	Thematic accuracy	Thematic range
FSC	SYKE	Sentinel 3 SLSTR	Geographic/WGS84	North-east Europe	0.005° and 0.05°	< 0.5 pixel	Daily	1 March – 31 May	15% FSC	[1, 100] FSC
FSC on lake Ice	SYKE	Sentinel-3 SLSTR	Geographic/WGS84	Largest lakes in North-east Europe	0.005°	< 0.5 pixel	2-3 days a week	1 February – 31 May	15% FSC	[1, 100] FSC
Land cover change indicator – regional	SYKE	Sentinel 3 OLCI	LAEA (etrs 1989)	North-east Europe	300 m	< 0.5 pixel	Annual	November-December	tbd	[1, 100] %
Land cover change indicator - local	SYKE	Sentinel 2 MSI	ETRS-TM35Fin	Local: sites to be decided	MMU 1 ha	< 0.5 pixel	Annual	November-December	tbd	0/1
Phenology – seasonal characteristics	SYKE	Sentinel 3 OLCI	LAEA (etrs 1989)	North-east Europe	MMU 1 km2	< 0.5 pixel	Annual	November-December	tbd	Start, maximum and end of growing season
Glacier ice velocity maps	GAMMA	Sentinel-1	Geographic/WGS84	Specific examples	50m	< 10m	seasonal or annual		To be determined	
Lake ice state	GAMMA	Sentinel-1	Geographic/WGS84	Specific examples	20m	< 10m	weekly	Oct - May	To be determined	Not frozen, frozen, bottom-fast
Freeze/thaw maps	GAMMA	Sentinel-1	Geographic/WGS84	Specific examples	50m	< 10m	weekly	Oct - May	To be determined	thawed, frozen
Reflectance	VTT	Sentinel-2 MSI	TBD/WGS84	North Europe	20 m	< 0.5 pixel	Every 3 days	Year round	n/a	n/a
Reflectance	VTT	Sentinel-3 OLCI	TBD/WGS84	North Europe	300 m	< 0.5 pixel	Every 1.5 days	Year round	n/a	n/a

List of Products

	Provider	Instrument	Priority	Notes
FSC	SYKE	S3 SLSTR	1	
FSC on Lake Ice	SYKE	S3 SLSTR	2	
Land cover change indicator - regional	SYKE	S3 OLCI	2	
Land cover change indicator - local	SYKE	S2 MSI	1	
Phenology - seasonal characteristics	SYKE	S3 OLCI	3	
Glacier ice velocity maps	GAMMA	S1	1	
Lake ice state	GAMMA	S1	2	
Freeze/thaw maps	GAMMA	S1	3	No demos
Reflectence	VTT	S2 MSI	1	Prequisite for SYKE products
Reflectance	VTT	S3 SLSTR	1	Prequisite for SYKE products
			1	Highest priority
			2	
			3	Lowest priority

Project organization structure