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Suivi haute-résolution de la neige et de la glace sur l'Europe

High-Resolution Snow & Ice monitoring (HR-S&I)

Copernicus Land Monitoring Service

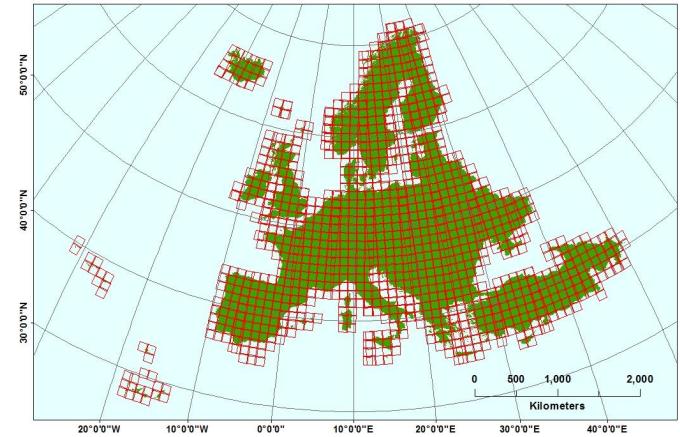
01/04/2022

Germain Salgues, Journée thématique du PNTS 2022



HR-S&I monitoring

- Objectif : générer des produits haute résolution de couverture neige et de glace (HR-S&I) à partir des observations des constellations Sentinel-2 et Sentinel-1, en temps réel et sur toute l'Europe.
- Ce projet s'inscrit dans le cadre du service Copernicus Land pour sa composante pan-européenne supportée par l'EEA, avec le support du CNES pour sa réalisation.



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- Les produits sont accessibles depuis les pages web du CLMS:
 - ◆ www.land.copernicus.eu.



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FMI



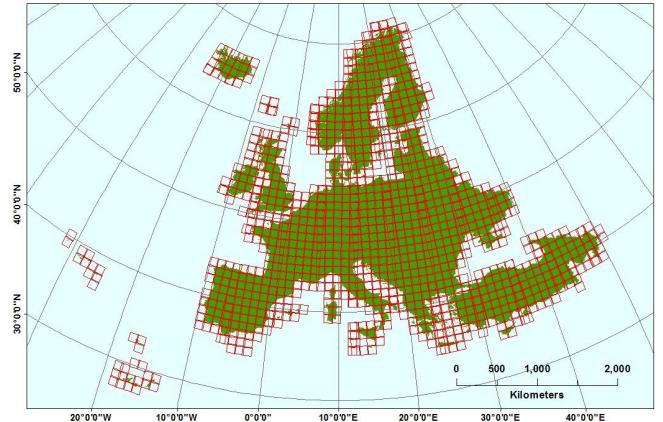
Users requirements → technical requirements

- **Large coverage and high resolution**
- **Historical data (processing since 09/2016)**

→ high volume of data

Sentinel-1 and Sentinel-2 data over EEA-39: ~230 + 550 products every day

→ requires massive and reliable computation resources and storage capacity



- **Near real time availability for time critical applications**
→ requires efficient computation and quick availability of the input data



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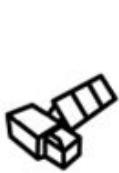
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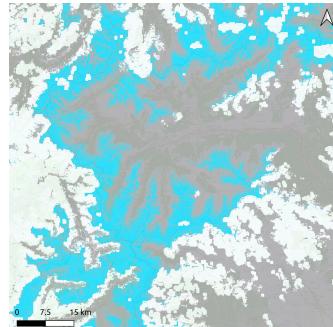
HR-S&I monitoring



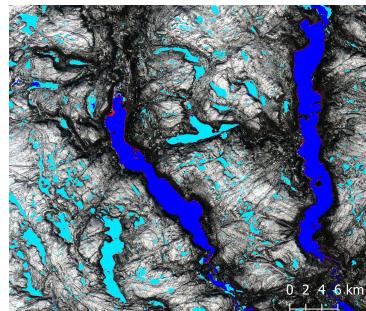
July
2020

Production based on
Sentinel-2 observations

Fractional Snow Cover



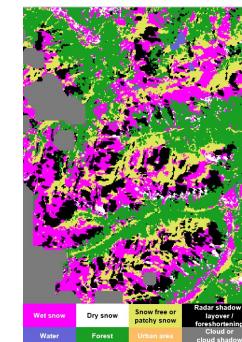
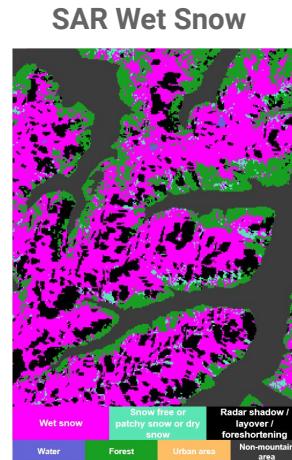
River and Lake Ice Extent S2



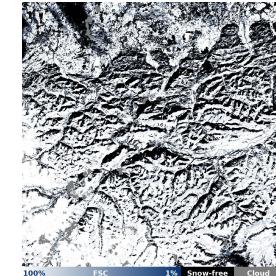
March
2022

Production based on
Sentinel-1 observations

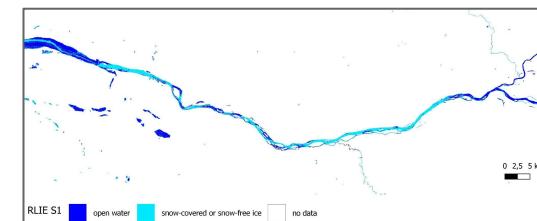
Wet Dry Snow



Daily Cumulative
Gap-filled Snow
Cover



River and Lake Ice Extent S1 and S1+S2



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WEkEO allows :

- automatic input data provisioning from DIAS Copernicus EO data
- dynamic allocation of processing resources for products generation
- and availability of HR-S&I products for visualization and download



HR-S&I is the first operational production use case in Near Real Time through WEkEO and for Copernicus services.



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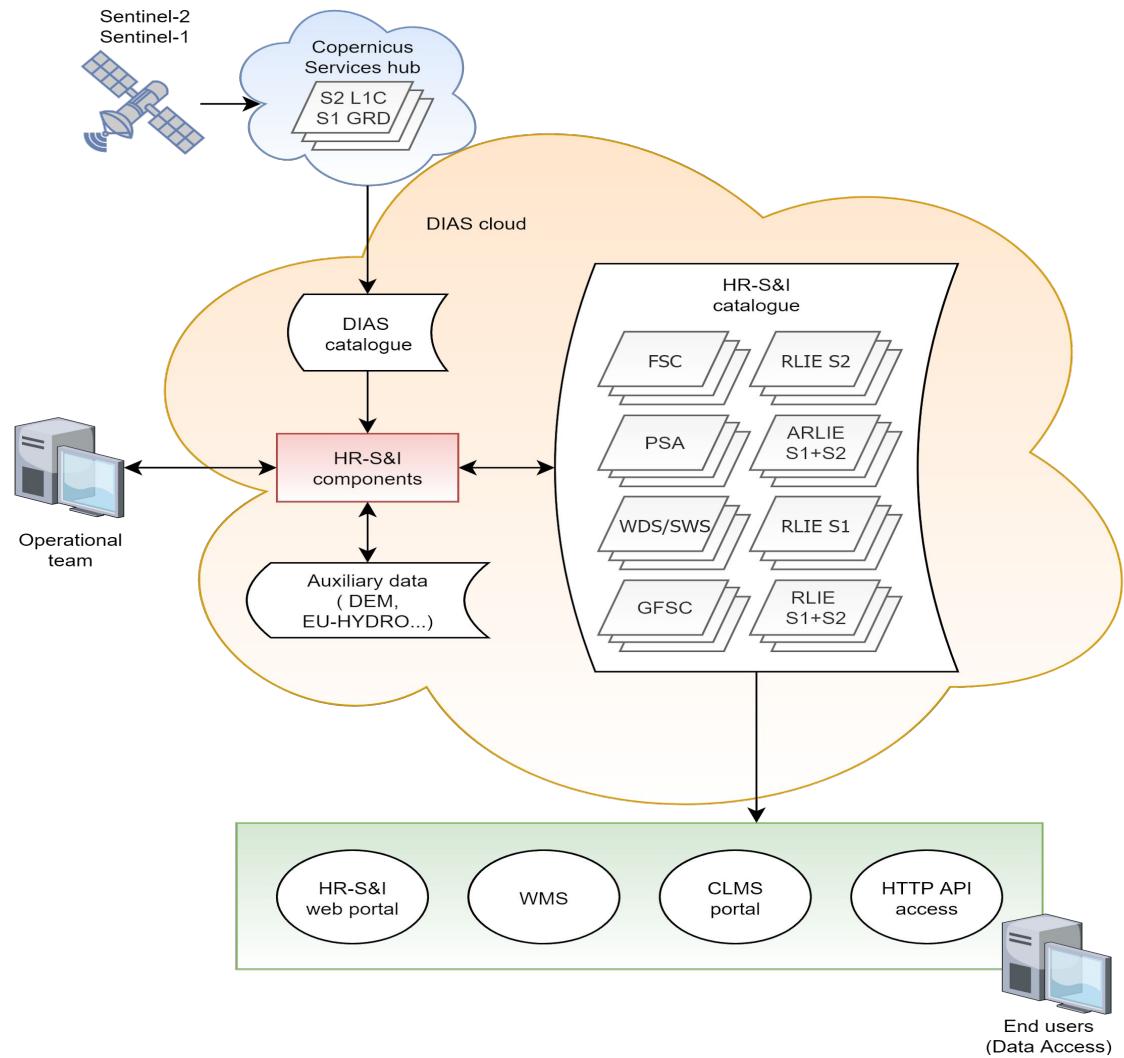


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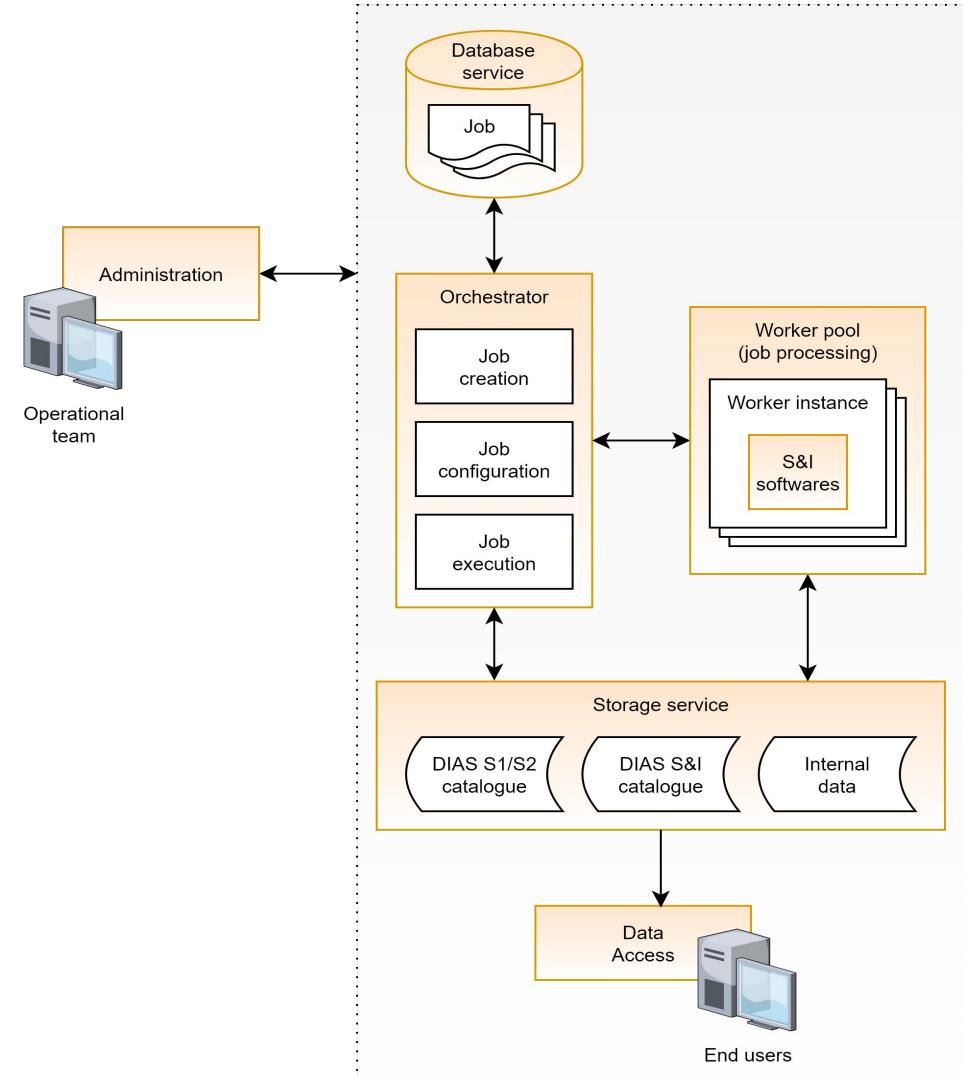
HR-S&I system

The system is hosted on the WEkEO DIAS (Data and Information Access Services).



Operational System

- **Orchestrator**, main process controlling the system
- **Worker pool**, run multiple instances of the **S&I processing chains**
- **Database service**, jobs description and other system information
- **Storage service**, standard S3 object storage
- **Data Access**, in charge of making the S&I products available to the end users,
- **Administration** tools used by the operational team for:
 - ◆ System monitoring and maintenance,
 - ◆ Manual job creation.



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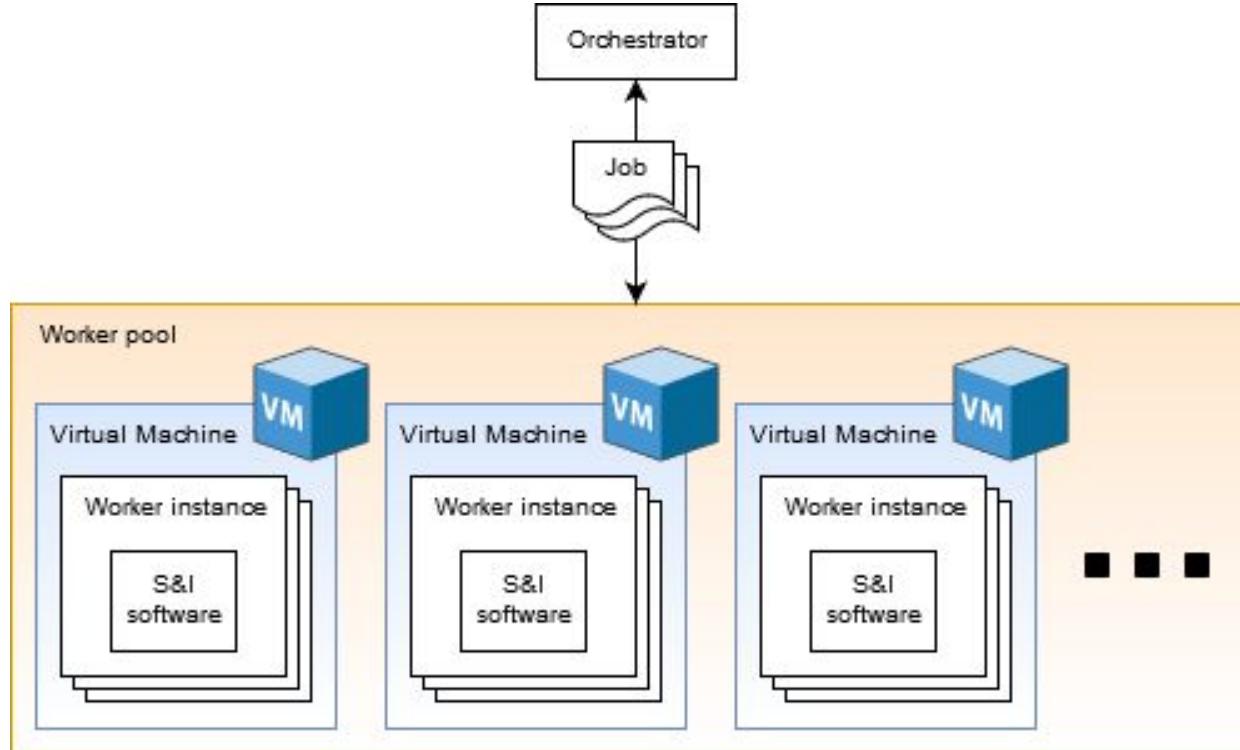
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→ Seizing of the system:

- ◆ up to 920 VCPUs for the workers (dynamically allocated)
- ◆ ~100TB for HR-S&I catalogue
- ◆ 10TB for system storage
- ◆ 10VMs for system services

VMs configurations:

- FSC/RLIE:
 - 2 vCores / 16 GB ram / 64 GB local SSD
 - processing in about 40 minutes,
- SWS/WDS:
 - 8 vCores / 64 GB ram / 256 GB local SSD
 - processing in less than 5 minutes,

→ **Core system dependencies:**

- ◆ OpenStack and its modules (OpenStack Heat...)
- ◆ VM flavor specific to the DIAS

→ **Other aspects are managed internally to the system:**

- ◆ VM images,
- ◆ Docker images,
- ◆ standard software installation (like Debian apt-get),
- ◆ etc...

→ **Project input and output dependencies**

◆ **Inputs:**

- DIAS HTTP API to access S2 data information and availability
- DIAS Storage (like S3) to access actual files

◆ **Outputs:**

- Integrate HR-S&I results into DIAS data access services

Processing de l'archive Sentinel-1 et Sentinel-2 depuis 01/09/2016

- Part 1 réalisée sur 6 mois sur un cluster HPC CNES (HAL) pour les produits FSC/RLIE S2
 - 639'715 L1C traités dont environ 59% ont généré des produits (couverture nuageuse < 90%)
 - temps moyen de processing par produit FSC/RLIE : 35 minutes
 - 200 TB de L2A générés et stockés
 - produits HR-SI stockés sur HAL : 2.35 TB
- Part 2 en cours (Novembre 2021 -> Mai 2022 sur le DIAS:
 - 1.5 mois pour les produits SWS/WDS et GFSC, avec 10VMs, 8vCPUs
 - 7 mois pour les produits RLIE S1, RLIE S1+S2 et ARLIE S1+S2, avec 7VMs, 32vCPUs



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