
NBS monthly report

MET Norway - NBS team

Nov 22, 2023

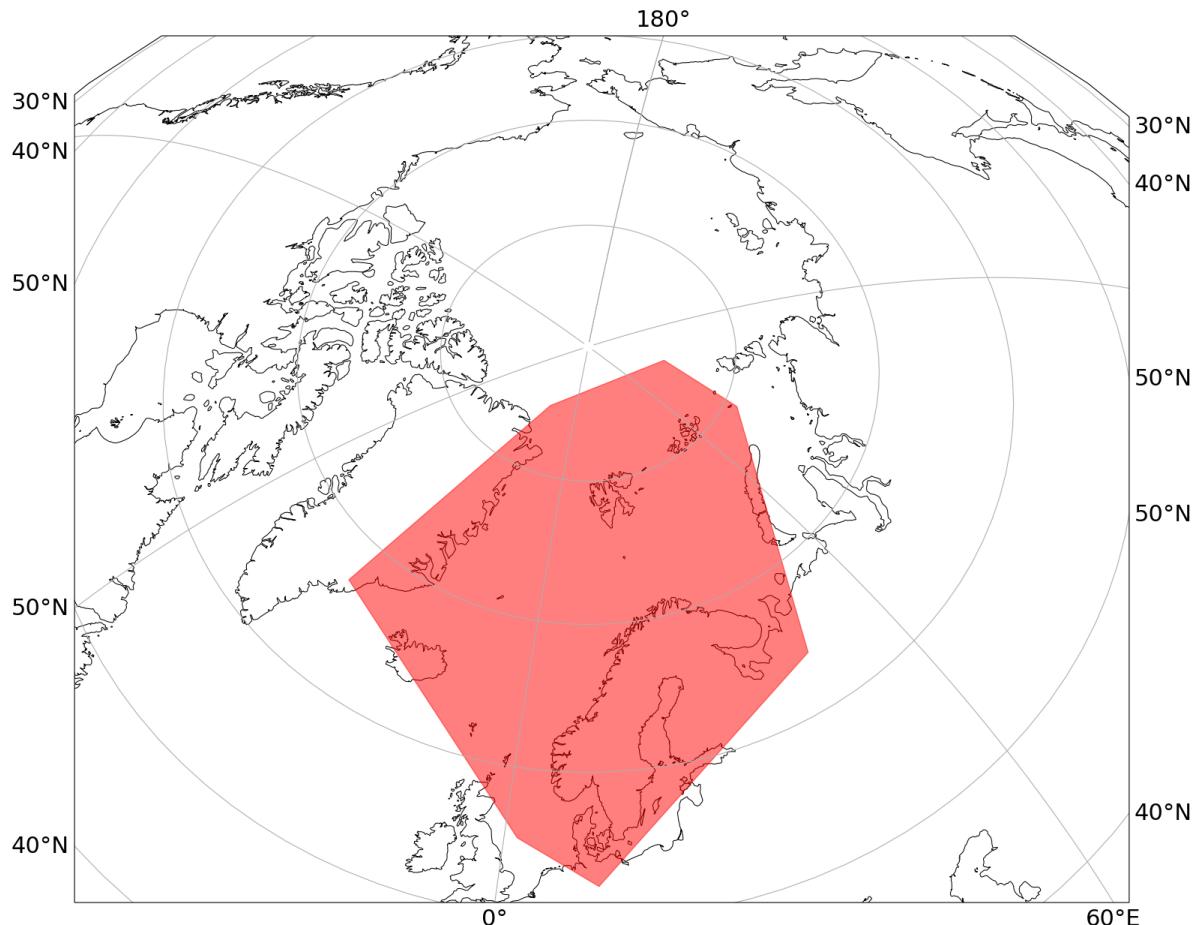
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NBS mothly report for November 2023

The NBS project

The European Space Agency (ESA) is in charge for the distribution of data from the Sentinel satellite constellation. In order to maintain a reliable and sustainable data hub, the creation and operation of multiples data hubs is necessary. With the purpose of keeping and maintaining a reliable and online source of data from the ESA Sentinel constellation for an Area Of Interest (AOI) covering Norway, the Norwegian Space Agency (NOSA) funded the National Bakke Segment (NBS) project. The map below is indicating the AOI in red.



Therefore, MET Norway was contracted for the operation of the NBS data. The NBS is implementd as a part of the operational infrastructure at MET Norway. As so it follows the normal procedures for planning, implementation and testing , and operationalisation. User access to the NBS is configured according to NOSA requirements. This includes the use of ESA's DHuS software for synchronization between ESA and user accessibility.

The present report is part of MET Norway duties to inform about its perfomance as operator of the NBS. Monthly reports will be created mothly to regularly comunicate the status of MET Norway's NBS.

The Sentinel products

The NBS project includes the management of the data received from Sentinel-1 (S1), Sentinel-2, Sentinel-3 (S3) and Sentinel-5p (S5p) satellites for the especified AOI. Each of the Sentinels has different operational modes for achieving

images with different characteristics. Those images can have different processing levels. The products included in the DHR are Level-1 images for all the Sentinels except for Sentinel-2. For which Level-1 (S2L1C) and Level-2 (S2L2A) are both included in the NBS.

BackEnds and FrontEnds

As operator of NBS, the source of Sentinel data is ESA; and ESA spreads the Sentinel data through the data hub Scihub (scihub.copernicus.eu). Scihub is ESA's FrontEnd (FE) for Sentinel data accessibility. MET Norway uses the DHS software for synchronization and creation of other FrontEnds. During the synchronization process a BackEnd (BE) is created. MET Norway is also running two FEs, colhub.met.no and colhub-archive.met.no. The colhub FE includes or will include all the products mentioned for Sentinel global products plus S3 marine products from Copernicus, S1 products from the Kongsberg Satellite Services (KSAT), and S2 Digital Elevation Model (DEM). The colhub-archive FE includes data from S1, S2L1C, S2L2A, S2DEM, S3, S5p products for the AOI. An important distinction between both FEs is that colhub-archive will always maintain available online all the products for the AOI.

In order to maintain an accountability on products synchronized from ESA's Scihub and available for users at the different FEs, it is necessary to understand the architecture of MET Norway's DHR.

**CHAPTER
ONE**

ACRONYMS

Here follows a formatted list of acronyms.

BE BackEnd

DEM Digital Elevation Model

DHuS Data Hub Software

ESA European Space Agency

FE FrontEnd

KSAT Kongsberg Satellite Services

MET Norway Meteorological Institute of Norway

S1 Sentinel-1

S2 Sentinel-2

S2L1C Sentinel-2 Level-1 C

S2L2A Sentinel-2 Level-2 A

S3 Sentinel-3

S5p Sentinel-5p

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**CHAPTER
TWO**

QUICK SUMMARY

The table below shows a short overview of the NBS performance operation during the last 30 days. The three different FEs and the BE are included. All columns represents the number of products in each portal excepting the last 3 columns. Those 3 columns represents the data flow from MET Norway to users through the portals where Volumes are measured in Tb.

Portals	S1	S2L1C	S2L2A	S3	S5p	Nb of users	Nb of products	Volume
colhub.met.no	5433	6052	6578	6638	9808	0	0	0.000
colhub-archive.met.no	5469	6596	6515	6569	9674	0	0	0.000
scihub.copernicus.eu	1649	4987	4987	8135	10393	-	-	-
MET Norway BE	0	1455	0	0	1155	-	-	-

Finally, the total amount of disk space dedicated to the NBS project, including either products in SAFE and NetCDF formats, represents 5000 Tb.

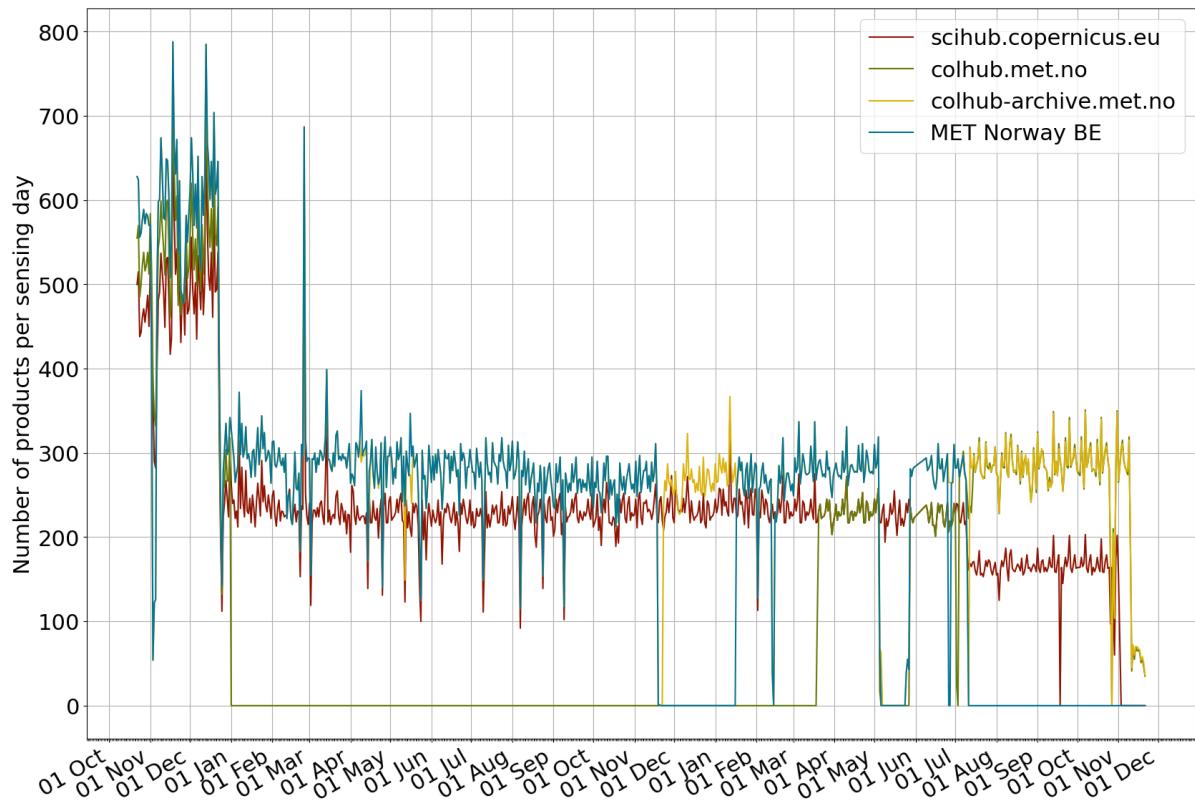
Due to tracking the data ingested and produced for the NBS project in the last year it is possible to forecast the upcoming need for disk space. As long as data flows follows the same pattern than last year, in 6 months the total disk space will grow until 6247 Tb; while in 12 months it is forecasted to become 6633 Tb.

SENTINEL-1 PRODUCTS

This section shows the performance of MET Norway for Sentinel-1 products. Both, an overall status and last month status are shown below.

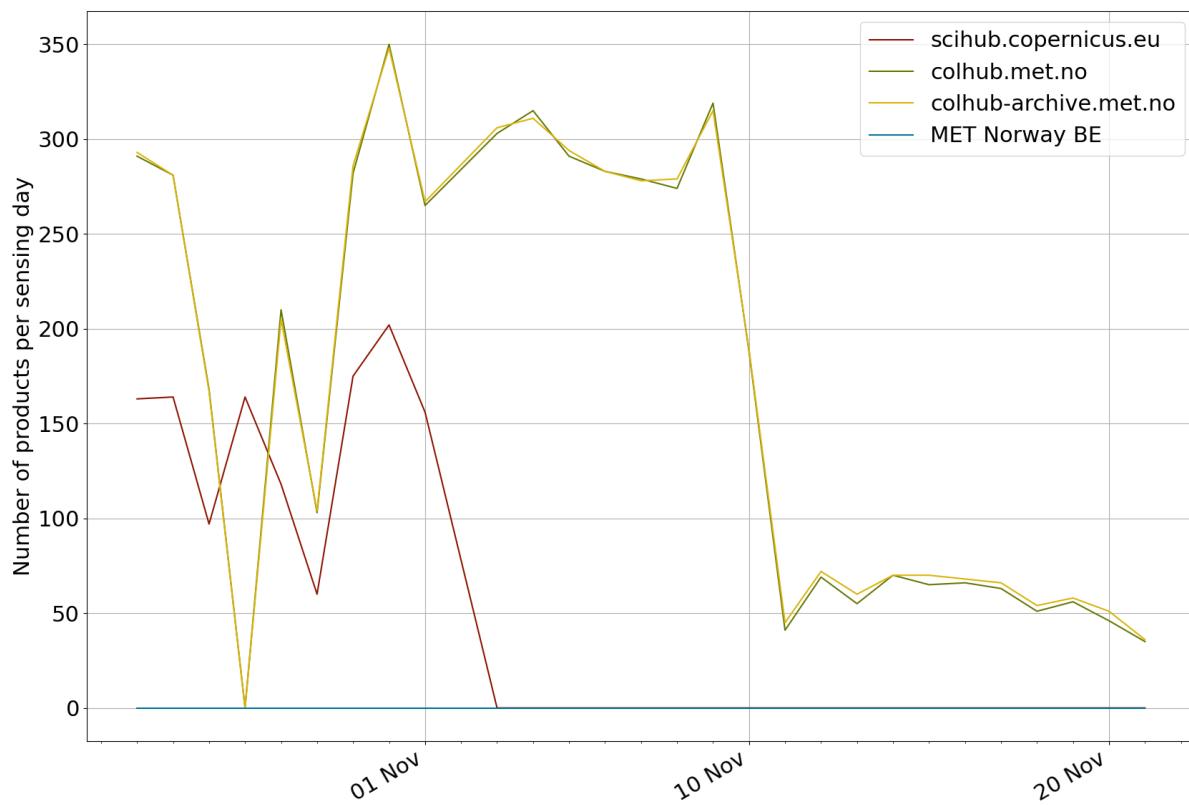
3.1 Products on portals

The following section contains an update on the Sentinel-1 products included in the different FEs and BEs.



The figure above represents the overall number of products present in the different BackEnds and FrontEnds per day for Sentinel-1.

While the figure below shows a zoom on the last 30 days.



A 30 days table is also included for more detailed information.

sensing_date	colhub.met.no	scihub.copernicues.eu	colhub-archive.met.no	\
2023-10-22	302	171.0	305.0	
2023-10-23	312	179.0	308.0	
2023-10-24	291	163.0	293.0	
2023-10-25	281	164.0	281.0	
2023-10-26	168	97.0	167.0	
2023-10-27	0	164.0	0.0	
2023-10-28	210	118.0	205.0	
2023-10-29	103	60.0	104.0	
2023-10-30	282	175.0	286.0	
2023-10-31	350	202.0	348.0	
2023-11-01	265	156.0	267.0	
2023-11-02	303	0.0	306.0	
2023-11-03	315	0.0	311.0	
2023-11-04	291	0.0	294.0	
2023-11-05	283	0.0	283.0	
2023-11-06	279	0.0	278.0	
2023-11-07	274	0.0	279.0	
2023-11-08	319	0.0	315.0	
2023-11-09	188	0.0	189.0	
2023-11-10	41	0.0	45.0	
2023-11-11	69	0.0	72.0	
2023-11-12	55	0.0	60.0	
2023-11-13	70	0.0	70.0	
2023-11-14	65	0.0	70.0	
2023-11-15	66	0.0	68.0	
2023-11-16	0.0	0.0	0.0	

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2023-11-17	63	0.0	66.0
2023-11-18	51	0.0	54.0
2023-11-19	56	0.0	58.0
2023-11-20	46	0.0	51.0
2023-11-21	35	0.0	36.0
MET Norway BE			
sensing_date			
2023-10-22	0.0		
2023-10-23	0.0		
2023-10-24	0.0		
2023-10-25	0.0		
2023-10-26	0.0		
2023-10-27	0.0		
2023-10-28	0.0		
2023-10-29	0.0		
2023-10-30	0.0		
2023-10-31	0.0		
2023-11-01	0.0		
2023-11-03	0.0		
2023-11-04	0.0		
2023-11-05	0.0		
2023-11-06	0.0		
2023-11-07	0.0		
2023-11-08	0.0		
2023-11-09	0.0		
2023-11-10	0.0		
2023-11-11	0.0		
2023-11-12	0.0		
2023-11-13	0.0		
2023-11-14	0.0		
2023-11-15	0.0		
2023-11-16	0.0		
2023-11-17	0.0		
2023-11-18	0.0		
2023-11-19	0.0		
2023-11-20	0.0		
2023-11-21	0.0		

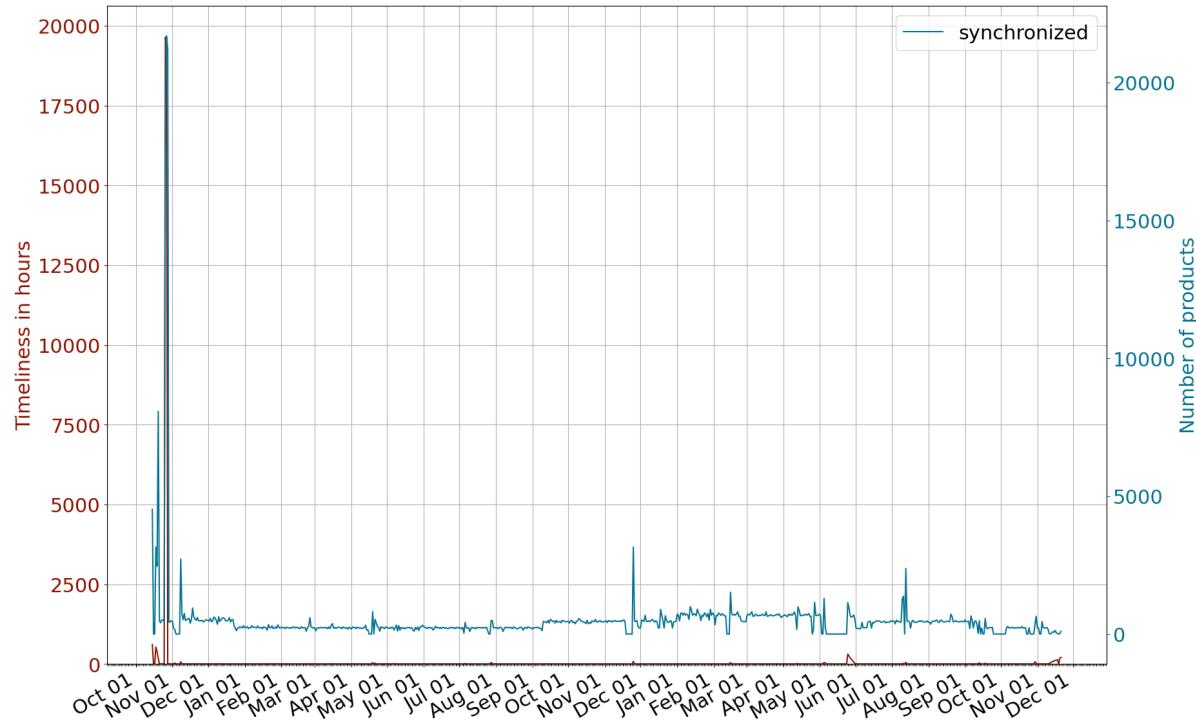
3.2 Missing products

The overall total number of Sentinel-1 products is 28265307. The number of overall Sentinel-1 missing products consists of 26023514 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

The total number of Sentinel-1 products in the last 30 days is 28259223. The number of Sentinel-1 missing products during the last 30 days consists of 26018314 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

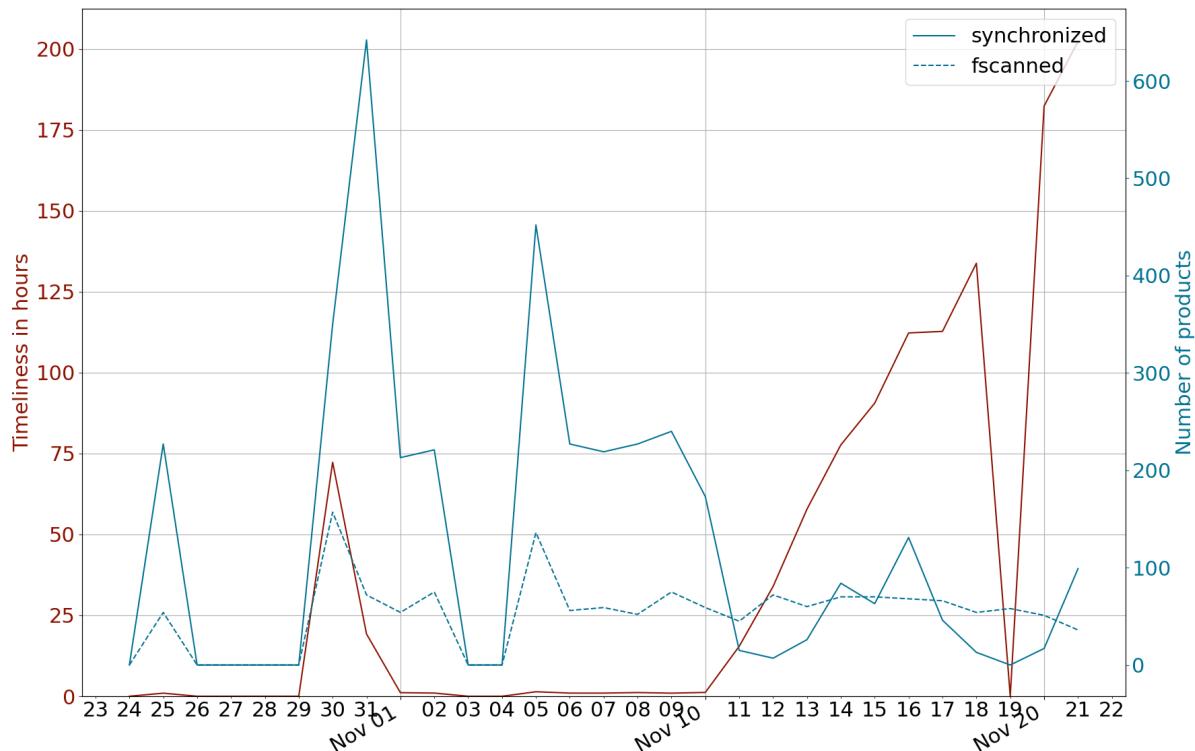
3.3 Data ingestion

In this section the time difference between sensing time and ingestion time at MET norway is assessed. The ingestion time is the time at which a Sentinel product was downloaded to MET Norway BE and so, it is automatically available in at least one of the MET Norway FEs.



The figure above shows an overall status of the Sentinel-1 synchronization between ESA datahub and MET Norway BE. The number of products synchronized and deleted are represented by the dark and light blue lines respectively. The red line represents the timeliness.

Following previous sections, the graph below shows a zoom in the last 30 days for the synchronization between ESA datahub and MET Norway BE.



A more detailed information is given in the table below where the last 30 days are assessed for products synchronized from ESA.

day	size	number	timeliness
2023-10-23	0.000000	0	0.000000
2023-10-24	0.000000	0	0.000000
2023-10-25	292.453690	227	0.957849
2023-10-26	0.000000	0	0.000000
2023-10-27	0.000000	0	0.000000
2023-10-28	0.000000	0	0.000000
2023-10-29	0.000000	0	0.000000
2023-10-30	469.893675	350	72.275411
2023-10-31	967.873667	642	19.240759
2023-11-01	284.251620	213	1.102856
2023-11-02	336.156693	221	0.988421
2023-11-03	0.000000	0	0.000000
2023-11-04	0.000000	0	0.000000
2023-11-05	630.690796	452	1.389680
2023-11-06	292.313560	227	0.977306
2023-11-07	330.065935	219	0.972964
2023-11-08	307.589884	227	1.139506
2023-11-09	352.627083	240	0.958345
2023-11-10	265.384369	173	1.180883
2023-11-11	63.824515	15	15.432398
2023-11-12	11.521272	7	33.916689
2023-11-13	68.882293	26	57.801575
2023-11-14	198.327530	84	77.657037
2023-11-15	152.446587	63	90.561755
2023-11-16	311.858780	131	112.234603
2023-11-17	67.839693	46	112.726231

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2023-11-18	81.310196	13	133.770630
2023-11-19	0.000000	0	0.000000
2023-11-20	49.242107	17	182.355458
2023-11-21	194.918099	99	202.287672

It is also given extra information in the table below where the last 30 days are assessed for products synchronized from KSAT.

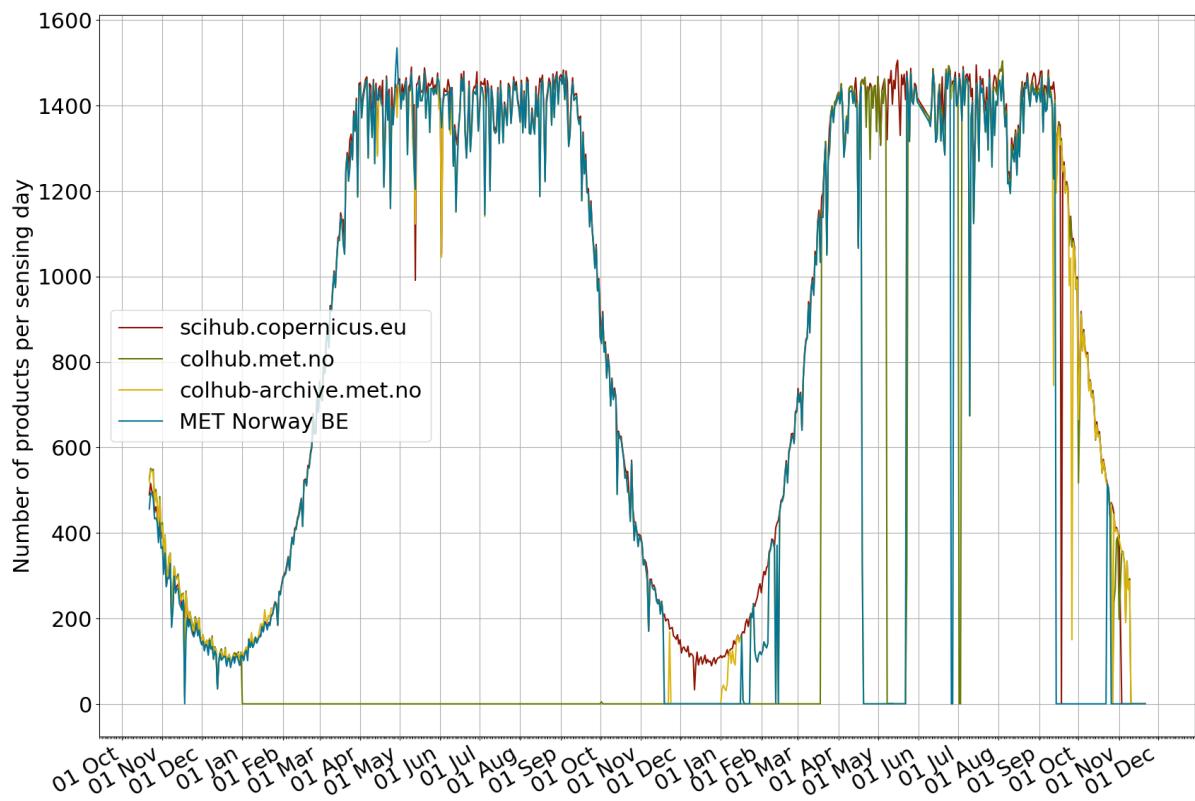
day	size	number	timeliness
2023-10-23	0.000000	0	0.000000
2023-10-24	0.000000	0	0.000000
2023-10-25	53.887880	54	0.830156
2023-10-26	0.000000	0	0.000000
2023-10-27	0.000000	0	0.000000
2023-10-28	0.000000	0	0.000000
2023-10-29	0.000000	0	0.000000
2023-10-30	175.102107	157	51.653751
2023-10-31	84.672117	72	0.772399
2023-11-01	51.152932	54	0.897486
2023-11-02	102.792513	75	1.279404
2023-11-03	0.000000	0	0.000000
2023-11-04	0.000000	0	0.000000
2023-11-05	161.198547	136	0.713172
2023-11-06	54.601834	56	0.602768
2023-11-07	73.725931	59	0.806074
2023-11-08	56.199789	52	0.690932
2023-11-09	71.592676	75	0.674928
2023-11-10	71.177996	59	0.662549
2023-11-11	57.791104	45	0.779619
2023-11-12	84.455101	72	0.771927
2023-11-13	54.575141	60	0.618561
2023-11-14	76.708853	70	0.669404
2023-11-15	81.214168	70	0.772807
2023-11-16	75.207100	68	0.662448
2023-11-17	78.184278	66	0.689080
2023-11-18	53.726294	54	0.580928
2023-11-19	73.625401	58	0.764443
2023-11-20	55.945775	51	0.686385
2023-11-21	69.311962	36	0.554235

SENTINEL-2 LEVEL-1C PRODUCTS

This section shows the performance of MET Norway for Sentinel-2 Level-1C products. Both, an overall status and last month status are shown below.

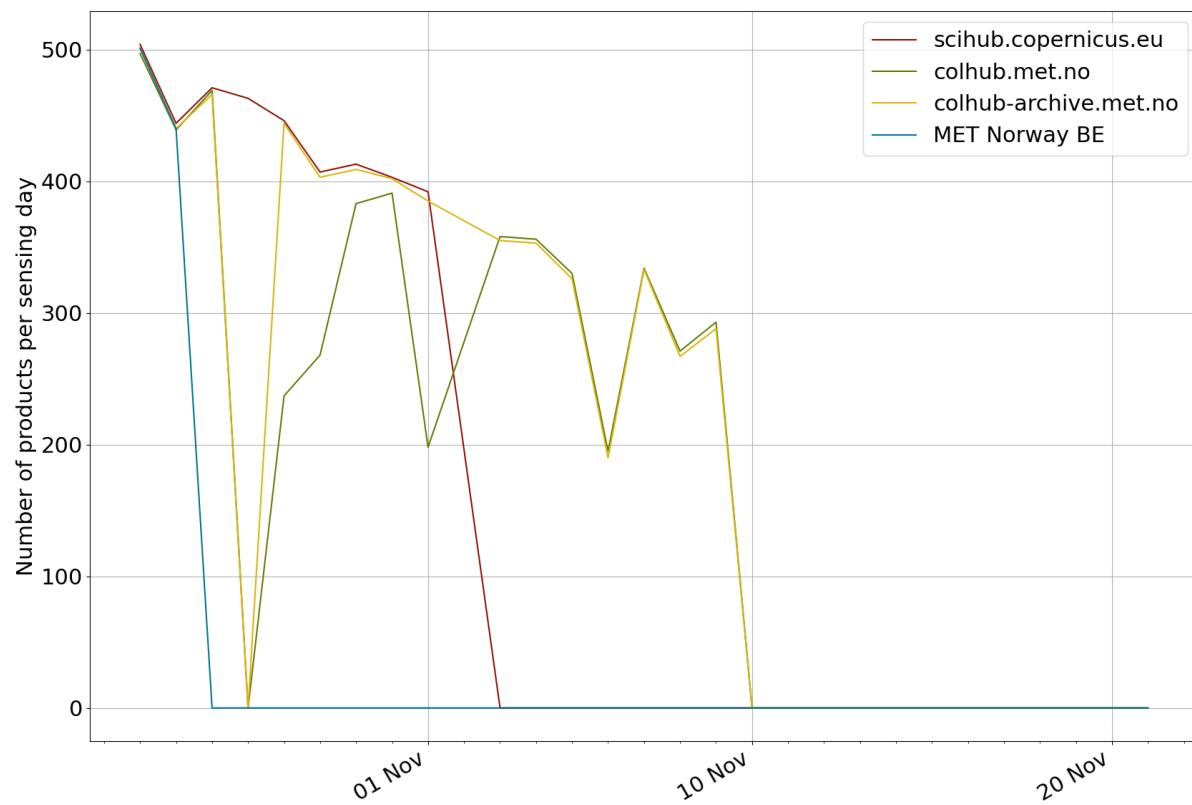
4.1 Products on portals

The following section contains an update on the Sentinel-2 Level-1C products included in the different FEs and BEs.



The figure above represents the overall number of products present in the different BackEnds and FrontEnds per day for Sentinel-2 Level-1C.

While the figure below shows a zoom on the last 30 days.



A 30 days table is also included for more detailed information.

sensing_date	colhub.met.no	scihub.copernicues.eu	colhub-archive.met.no	\
2023-10-22	522	528.0	520.0	
2023-10-23	511	516.0	514.0	
2023-10-24	497	504.0	501.0	
2023-10-25	439	444.0	440.0	
2023-10-26	469	471.0	466.0	
2023-10-27	0	463.0	0.0	
2023-10-28	237	446.0	444.0	
2023-10-29	268	407.0	403.0	
2023-10-30	383	413.0	409.0	
2023-10-31	391	403.0	402.0	
2023-11-01	198	392.0	385.0	
2023-11-03	358	0.0	355.0	
2023-11-04	356	0.0	353.0	
2023-11-05	330	0.0	326.0	
2023-11-06	195	0.0	190.0	
2023-11-07	334	0.0	333.0	
2023-11-08	271	0.0	267.0	
2023-11-09	293	0.0	288.0	
2023-11-10	0	0.0	0.0	
2023-11-11	0	0.0	0.0	
2023-11-12	0	0.0	0.0	
2023-11-13	0	0.0	0.0	
2023-11-14	0	0.0	0.0	
2023-11-15	0	0.0	0.0	
2023-11-16	0	0.0	0.0	

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2023-11-17	0	0.0	0.0
2023-11-18	0	0.0	0.0
2023-11-19	0	0.0	0.0
2023-11-20	0	0.0	0.0
2023-11-21	0	0.0	0.0
MET Norway BE			
sensing_date			
2023-10-22	0.0		
2023-10-23	514.0		
2023-10-24	501.0		
2023-10-25	440.0		
2023-10-26	0.0		
2023-10-27	0.0		
2023-10-28	0.0		
2023-10-29	0.0		
2023-10-30	0.0		
2023-10-31	0.0		
2023-11-01	0.0		
2023-11-03	0.0		
2023-11-04	0.0		
2023-11-05	0.0		
2023-11-06	0.0		
2023-11-07	0.0		
2023-11-08	0.0		
2023-11-09	0.0		
2023-11-10	0.0		
2023-11-11	0.0		
2023-11-12	0.0		
2023-11-13	0.0		
2023-11-14	0.0		
2023-11-15	0.0		
2023-11-16	0.0		
2023-11-17	0.0		
2023-11-18	0.0		
2023-11-19	0.0		
2023-11-20	0.0		
2023-11-21	0.0		

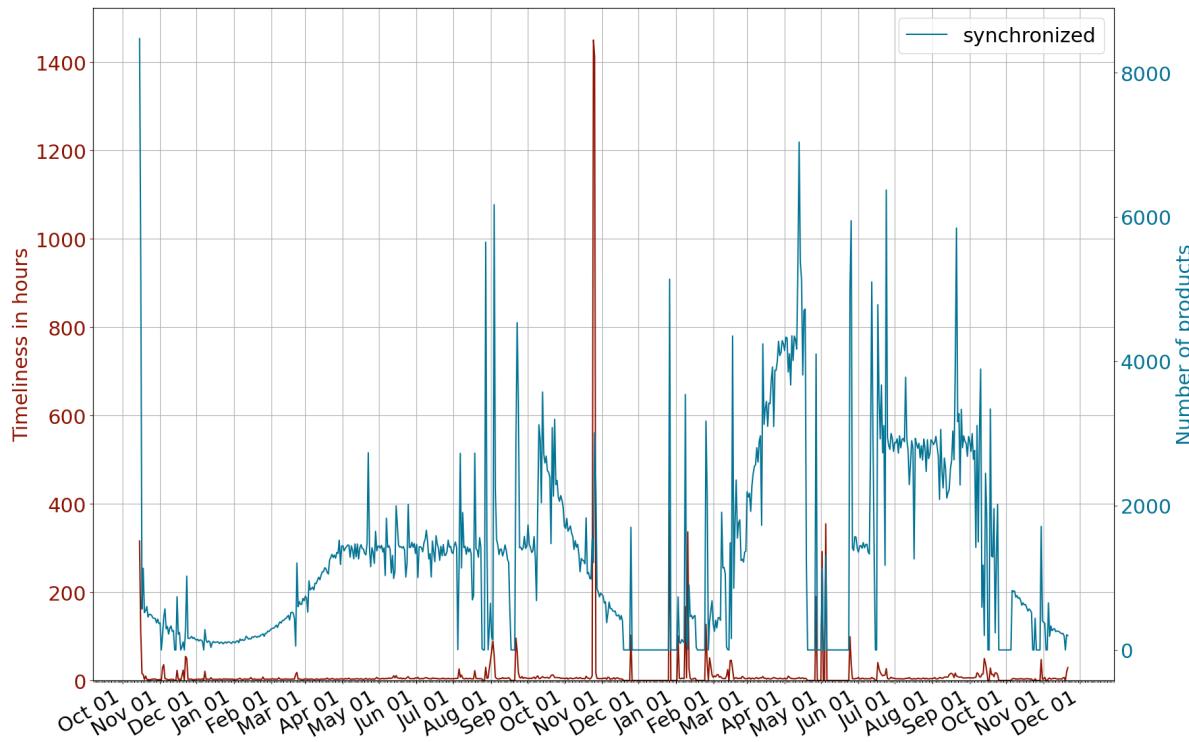
4.2 Missing products

The overall total number of Sentinel-2 Level-1C products is 28265307. The number of overall Sentinel-2 Level-1C missing products consists of 26023514 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

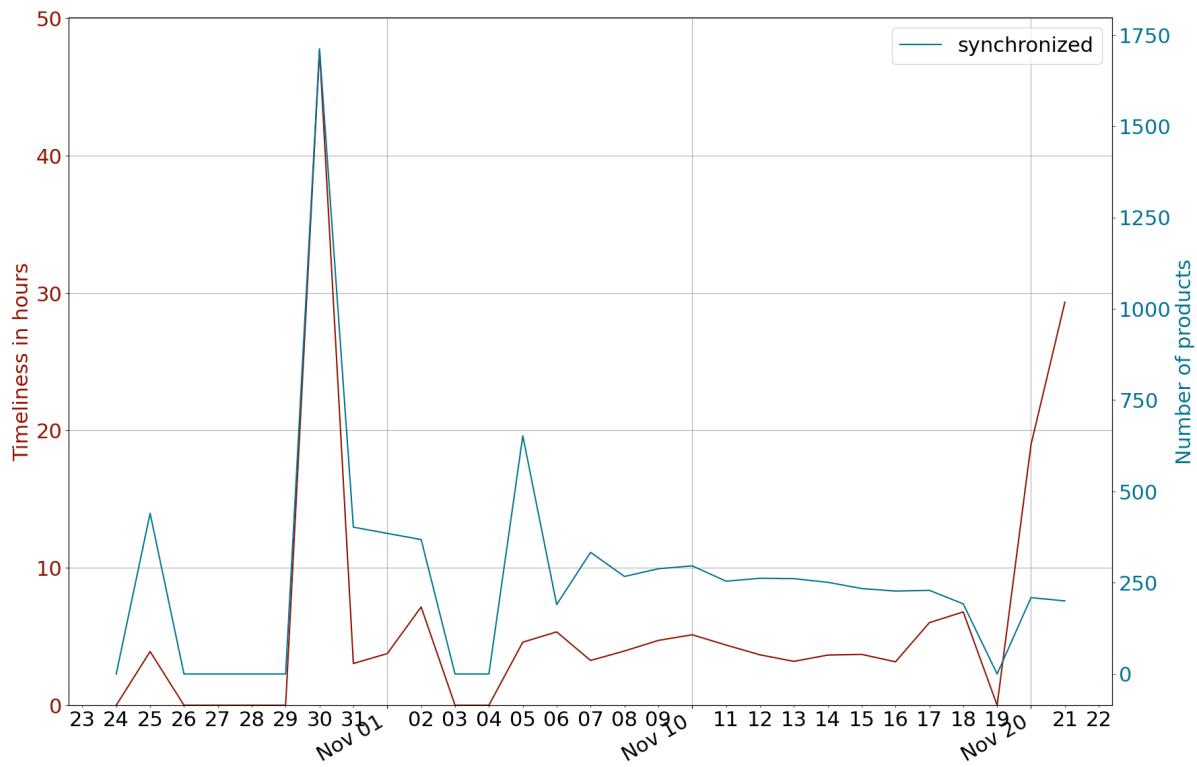
The total number of Sentinel-2 Level-1C products in the last 30 days is 28259223. The number of Sentinel-2 Level-1C missing products during the last 30 days consists of 26018314 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

4.3 Data ingestion

In this section the time difference between sensing time and ingestion time at MET norway is assessed. The ingestion time is the time at which a Sentinel product was downloaded to MET Norway BE and so, it is automatically available in at least one of the MET Norway FEs.



Following previous sections, the graph below shows a zoom in the last 30 days for the synchronization between ESA datahub and MET Norway BE.



A more detailed information is given in the table below where the last 30 days are assessed for products synchronized from ESA.

day	size	number	timeliness
2023-10-23	0.000000	0	0.000000
2023-10-24	0.000000	0	0.000000
2023-10-25	211.384623	440	3.908087
2023-10-26	0.000000	0	0.000000
2023-10-27	0.000000	0	0.000000
2023-10-28	0.000000	0	0.000000
2023-10-29	0.000000	0	0.000000
2023-10-30	798.241474	1712	47.674212
2023-10-31	188.090003	402	3.036394
2023-11-01	176.076454	385	3.758030
2023-11-02	169.789412	368	7.150638
2023-11-03	0.000000	0	0.000000
2023-11-04	0.000000	0	0.000000
2023-11-05	279.823372	652	4.590180
2023-11-06	86.825472	190	5.337089
2023-11-07	151.681874	333	3.258253
2023-11-08	125.747683	267	3.945383
2023-11-09	132.564068	288	4.717263
2023-11-10	128.964512	296	5.129273
2023-11-11	117.313962	254	4.381448
2023-11-12	127.733747	262	3.669513
2023-11-13	115.660112	261	3.192290
2023-11-14	114.127587	251	3.649972
2023-11-15	111.305050	234	3.701655
2023-11-16	110.098514	227	3.159830
2023-11-17	112.752569	229	6.009297

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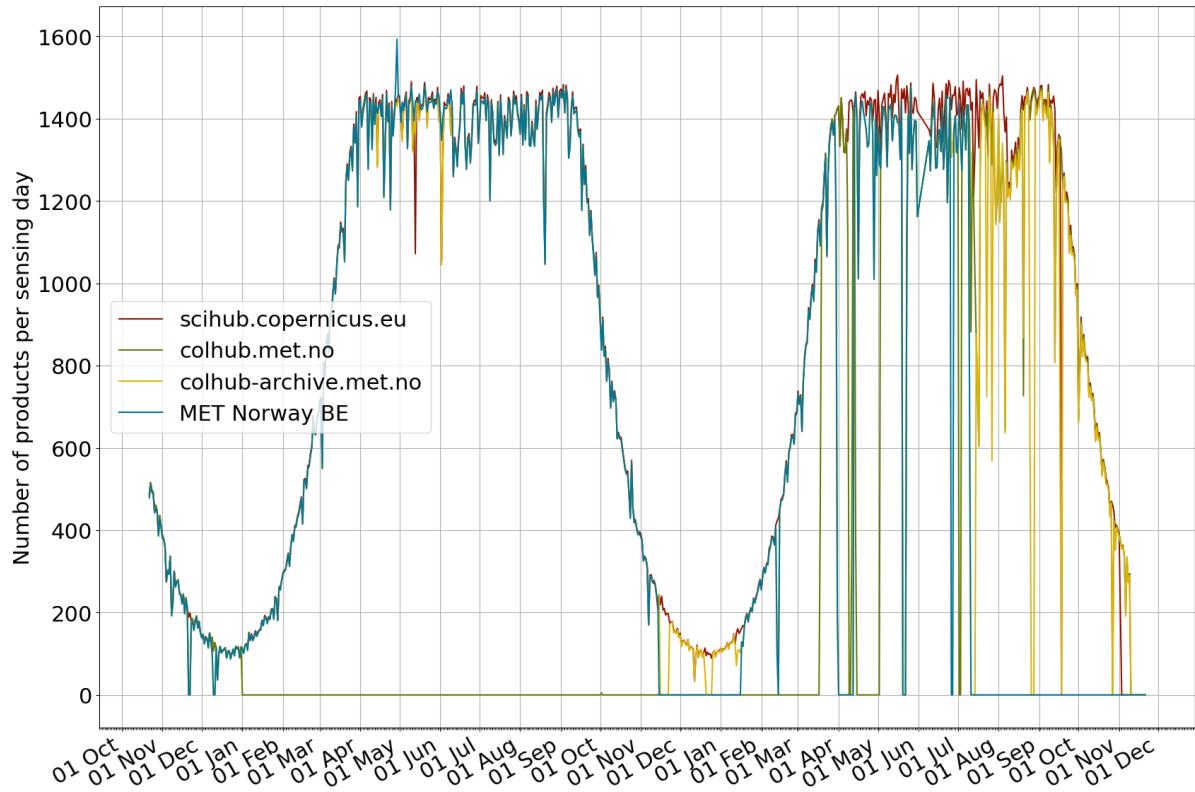
2023-11-18	96.394335	192	6.790357
2023-11-19	0.000000	0	0.000000
2023-11-20	101.277335	209	18.964207
2023-11-21	93.756010	200	29.336751

SENTINEL-2 LEVEL-2A PRODUCTS

This section shows the performance of MET Norway for Sentinel-2 Level-2A products. Both, an overall status and last month status are shown below.

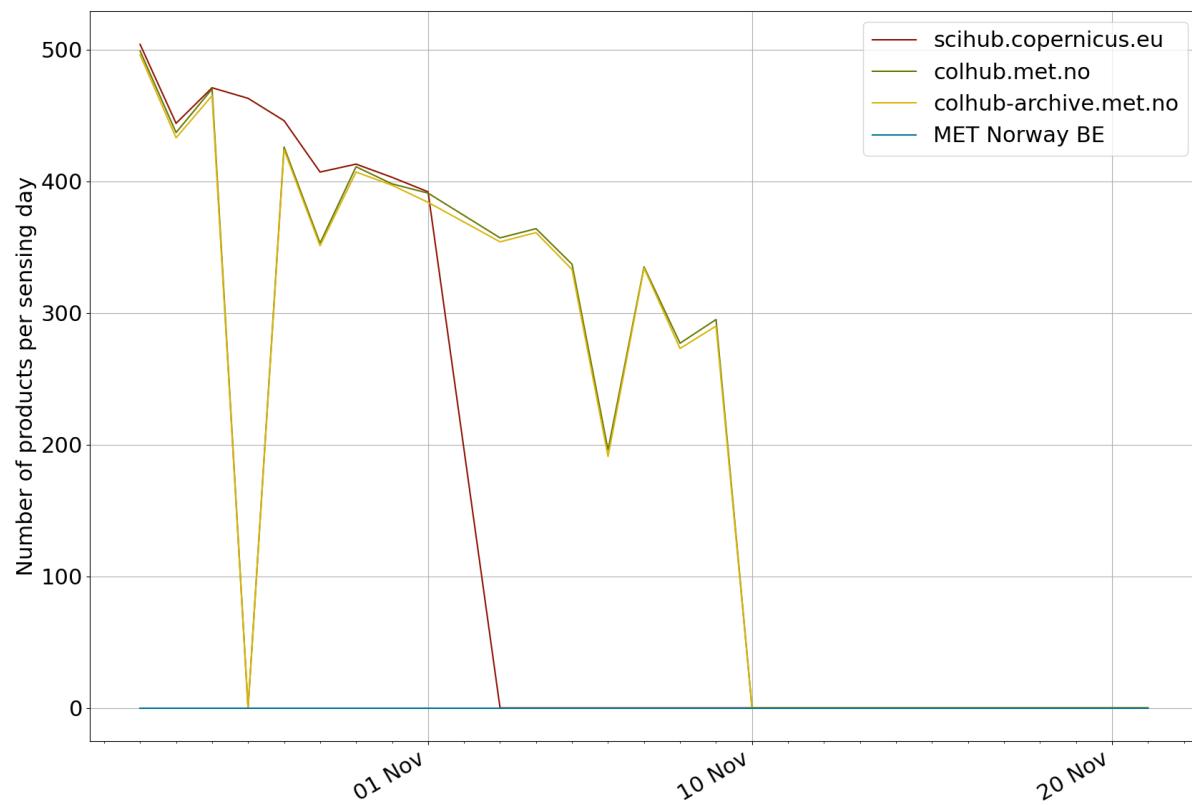
5.1 Products on portals

The following section contains an update on the Sentinel-2 Level-2A products included in the different FEs and BEs.



The figure above represents the overall number of products present in the different BackEnds and FrontEnds per day for Sentinel-2 Level-2A.

While the figure below shows a zoom on the last 30 days.



A 30 days table is also included for more detailed information.

sensing_date	colhub.met.no	scihub.copernicues.eu	colhub-archive.met.no	\
2023-10-22	518	528.0	510.0	
2023-10-23	514	516.0	512.0	
2023-10-24	499	504.0	496.0	
2023-10-25	437	444.0	433.0	
2023-10-26	470	471.0	465.0	
2023-10-27	0	463.0	0.0	
2023-10-28	426	446.0	424.0	
2023-10-29	353	407.0	351.0	
2023-10-30	411	413.0	407.0	
2023-10-31	398	403.0	397.0	
2023-11-01	391	392.0	384.0	
2023-11-03	357	0.0	354.0	
2023-11-04	364	0.0	361.0	
2023-11-05	337	0.0	333.0	
2023-11-06	196	0.0	191.0	
2023-11-07	335	0.0	334.0	
2023-11-08	277	0.0	273.0	
2023-11-09	295	0.0	290.0	
2023-11-10	0	0.0	0.0	
2023-11-11	0	0.0	0.0	
2023-11-12	0	0.0	0.0	
2023-11-13	0	0.0	0.0	
2023-11-14	0	0.0	0.0	
2023-11-15	0	0.0	0.0	
2023-11-16	0	0.0	0.0	

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2023-11-17	0	0.0	0.0
2023-11-18	0	0.0	0.0
2023-11-19	0	0.0	0.0
2023-11-20	0	0.0	0.0
2023-11-21	0	0.0	0.0
MET Norway BE			
sensing_date			
2023-10-22	0.0		
2023-10-23	0.0		
2023-10-24	0.0		
2023-10-25	0.0		
2023-10-26	0.0		
2023-10-27	0.0		
2023-10-28	0.0		
2023-10-29	0.0		
2023-10-30	0.0		
2023-10-31	0.0		
2023-11-01	0.0		
2023-11-03	0.0		
2023-11-04	0.0		
2023-11-05	0.0		
2023-11-06	0.0		
2023-11-07	0.0		
2023-11-08	0.0		
2023-11-09	0.0		
2023-11-10	0.0		
2023-11-11	0.0		
2023-11-12	0.0		
2023-11-13	0.0		
2023-11-14	0.0		
2023-11-15	0.0		
2023-11-16	0.0		
2023-11-17	0.0		
2023-11-18	0.0		
2023-11-19	0.0		
2023-11-20	0.0		
2023-11-21	0.0		

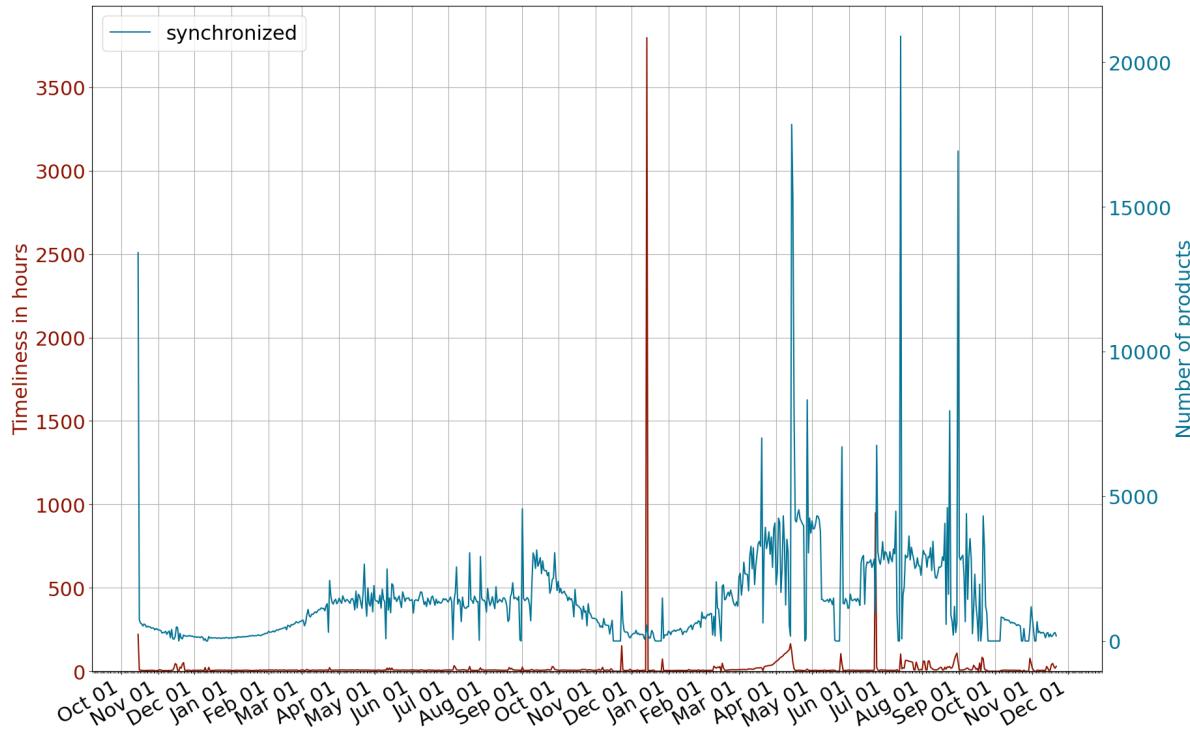
5.2 Missing products

The overall total number of Sentinel-2 Level-2A products is 28265307. The number of overall Sentinel-2 Level-2A missing products consists of 26023514 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

The total number of Sentinel-2 level-2A products in the last 30 days is 28259223. The number of Sentinel-2 Level-2A missing products during the last 30 days consists of 26018314 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

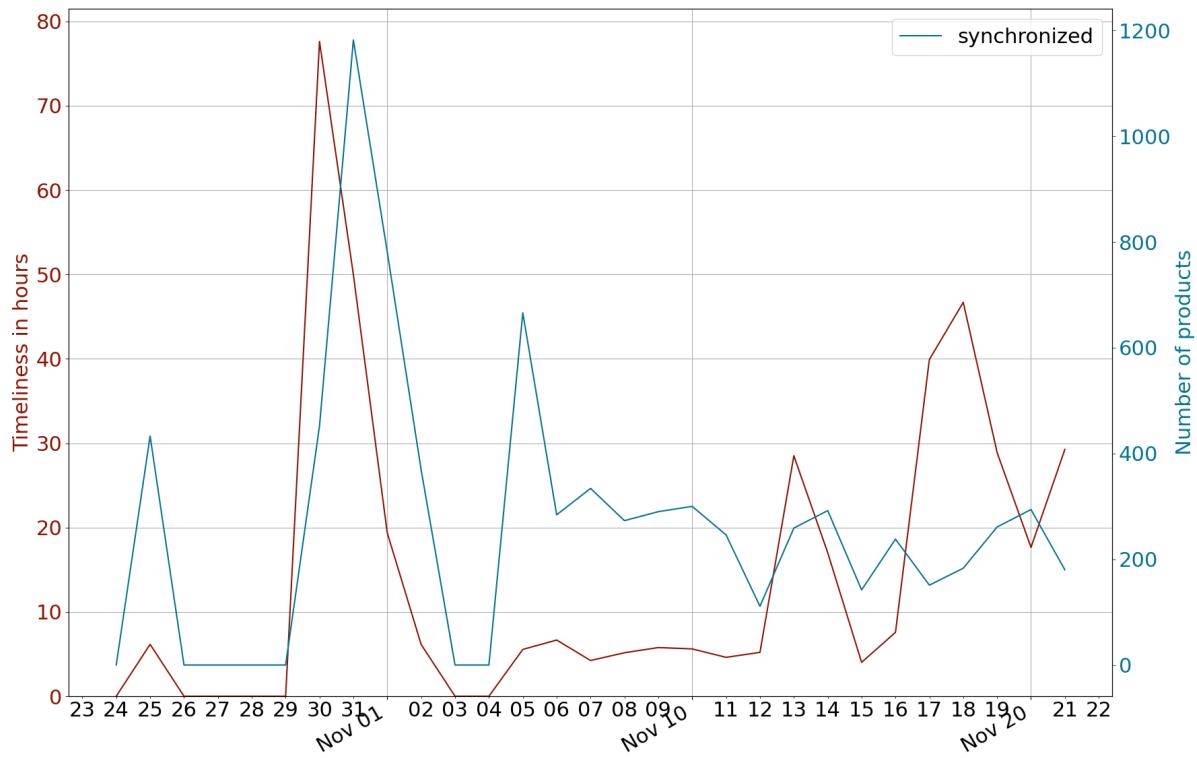
5.3 Data ingestion

In this section the time difference between sensing time and ingestion time at MET norway is assessed. The ingestion time is the time at which a Sentinel product was downloaded to MET Norway BE and so, it is automatically available in at least one of the MET Norway FEs.



The figure above shows an overall status of the Sentinel-2 Level-2A synchronization between ESA datahub and MET Norway BE. The number of products synchronized and deleted are represented by the dark and light blue lines respectively. The red line represents the timeliness.

Following previous sections, the graph below shows a zoom in the last 30 days for the synchronization between ESA datahub and MET Norway BE.



A more detailed information is given in the table below where the last 30 days are assessed for products synchronized from ESA.

day	size	number	timeliness
2023-10-23	0.000000	0	0.000000
2023-10-24	0.000000	0	0.000000
2023-10-25	265.246783	433	6.154379
2023-10-26	0.000000	0	0.000000
2023-10-27	0.000000	0	0.000000
2023-10-28	0.000000	0	0.000000
2023-10-29	0.000000	0	0.000000
2023-10-30	264.080131	452	77.624873
2023-10-31	697.412328	1182	49.973818
2023-11-01	457.715291	781	19.355933
2023-11-02	212.772175	369	6.134824
2023-11-03	0.000000	0	0.000000
2023-11-04	0.000000	0	0.000000
2023-11-05	356.825453	666	5.551412
2023-11-06	129.397743	284	6.662515
2023-11-07	190.607343	334	4.237724
2023-11-08	159.834955	273	5.156798
2023-11-09	165.733099	290	5.772668
2023-11-10	162.371277	300	5.612555
2023-11-11	142.368633	246	4.614094
2023-11-12	67.980167	111	5.201007
2023-11-13	149.639818	259	28.509132
2023-11-14	169.477424	292	17.019890
2023-11-15	85.179354	142	4.021108
2023-11-16	140.270216	238	7.573814
2023-11-17	90.539176	151	39.912122

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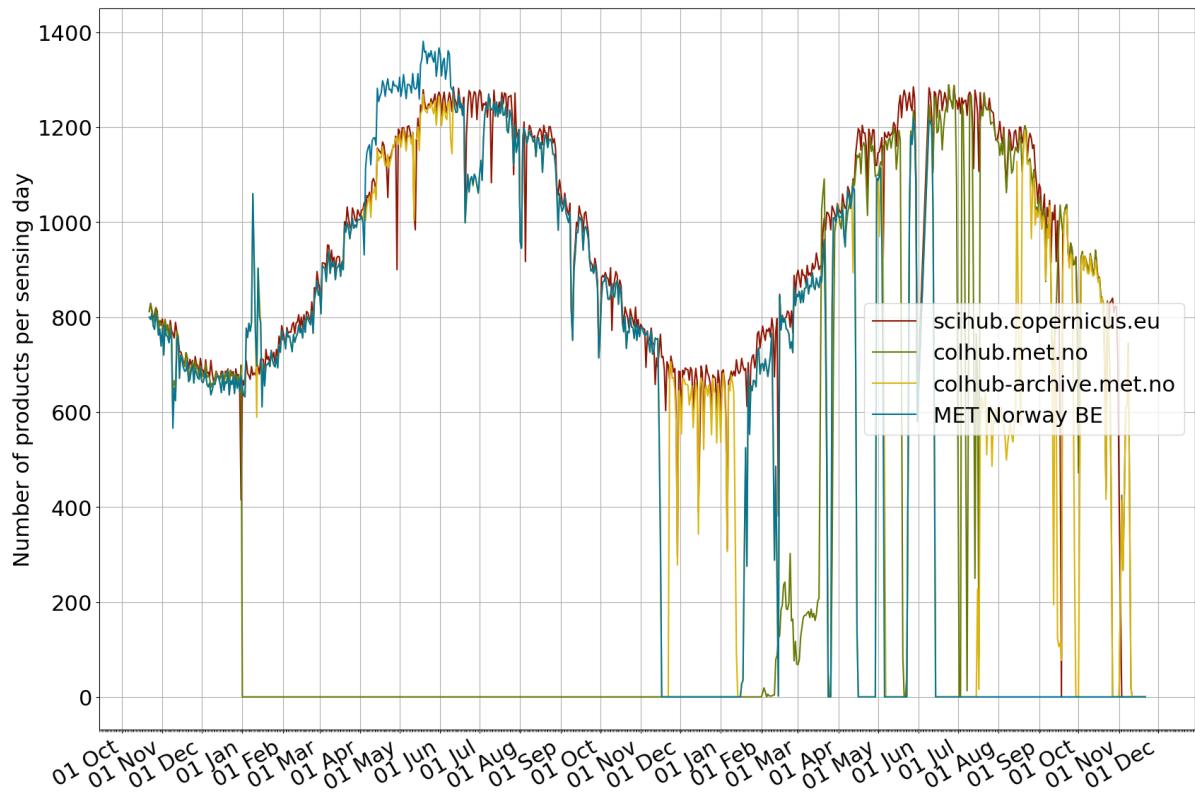
2023-11-18	108.488903	183	46.698364
2023-11-19	167.228905	261	28.887031
2023-11-20	172.160775	294	17.645701
2023-11-21	103.916943	180	29.264855

SENTINEL-3 PRODUCTS

This section shows the performance of MET Norway for Sentinel-3 products. Both, an overall status and last month status are shown below.

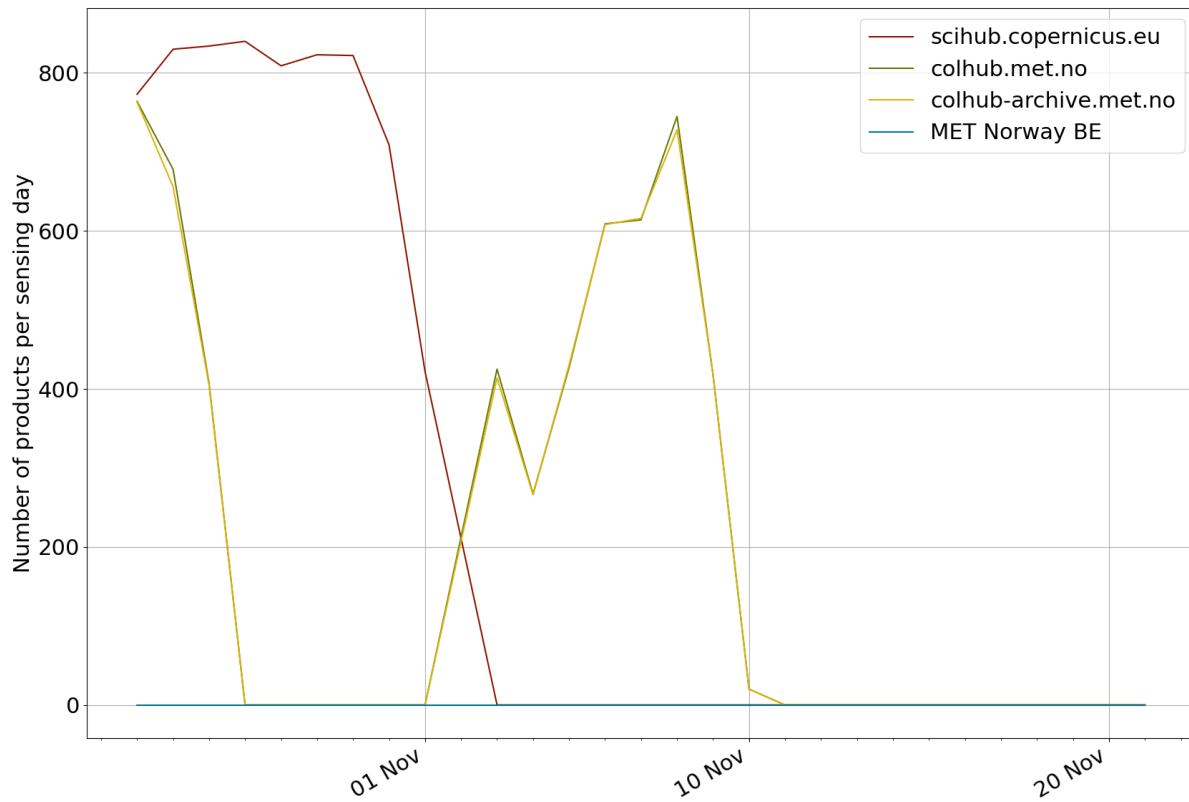
6.1 Products on portals

The following section contains an update on the Sentinel-3 products included in the different FEs and BEs.



The figure above represents the overall number of products present in the different BackEnds and FrontEnds per day for Sentinel-3.

While the figure below shows a zoom on the last 30 days.



A 30 days table is also included for more detailed information.

sensing_date	colhub.met.no	scihub.copernicues.eu	colhub-archive.met.no	\
2023-10-22	430	439.0	416.0	
2023-10-23	834	834.0	829.0	
2023-10-24	764	773.0	763.0	
2023-10-25	678	830.0	656.0	
2023-10-26	407	834.0	405.0	
2023-10-27	0	840.0	0.0	
2023-10-28	0	809.0	0.0	
2023-10-29	0	823.0	0.0	
2023-10-30	0	822.0	0.0	
2023-10-31	0	709.0	0.0	
2023-11-01	0	422.0	0.0	
2023-11-03	425	0.0	414.0	
2023-11-04	267	0.0	266.0	
2023-11-05	427	0.0	430.0	
2023-11-06	609	0.0	608.0	
2023-11-07	614	0.0	616.0	
2023-11-08	745	0.0	728.0	
2023-11-09	418	0.0	418.0	
2023-11-10	20	0.0	20.0	
2023-11-11	0	0.0	0.0	
2023-11-12	0	0.0	0.0	
2023-11-13	0	0.0	0.0	
2023-11-14	0	0.0	0.0	
2023-11-15	0	0.0	0.0	
2023-11-16	0	0.0	0.0	

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2023-11-17	0	0.0	0.0
2023-11-18	0	0.0	0.0
2023-11-19	0	0.0	0.0
2023-11-20	0	0.0	0.0
2023-11-21	0	0.0	0.0
MET Norway BE			
sensing_date			
2023-10-22	0.0		
2023-10-23	0.0		
2023-10-24	0.0		
2023-10-25	0.0		
2023-10-26	0.0		
2023-10-27	0.0		
2023-10-28	0.0		
2023-10-29	0.0		
2023-10-30	0.0		
2023-10-31	0.0		
2023-11-01	0.0		
2023-11-03	0.0		
2023-11-04	0.0		
2023-11-05	0.0		
2023-11-06	0.0		
2023-11-07	0.0		
2023-11-08	0.0		
2023-11-09	0.0		
2023-11-10	0.0		
2023-11-11	0.0		
2023-11-12	0.0		
2023-11-13	0.0		
2023-11-14	0.0		
2023-11-15	0.0		
2023-11-16	0.0		
2023-11-17	0.0		
2023-11-18	0.0		
2023-11-19	0.0		
2023-11-20	0.0		
2023-11-21	0.0		

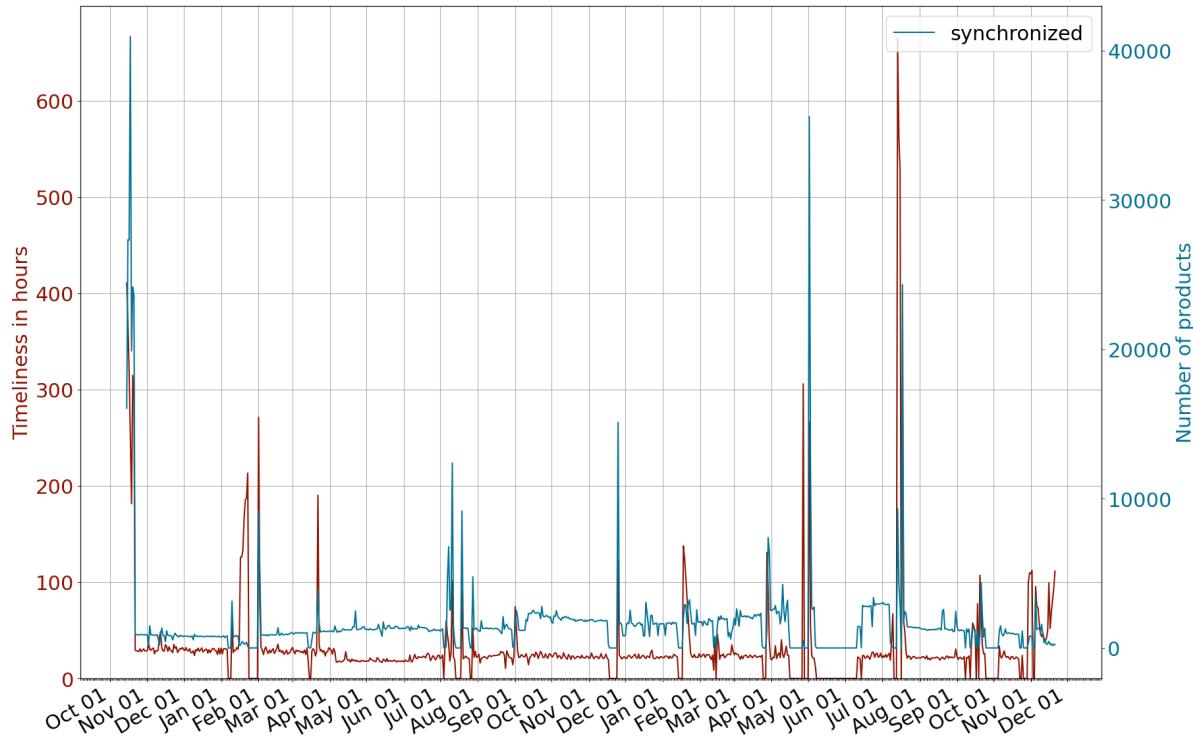
6.2 Missing products

The overall total number of Sentinel-3 products is 28265307. The number of overall Sentinel-3 missing products consists of 26023514 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

The total number of Sentinel-3 products in the last 30 days is 28259223. The number of Sentinel-3 missing products during the last 30 days consists of 26018314 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

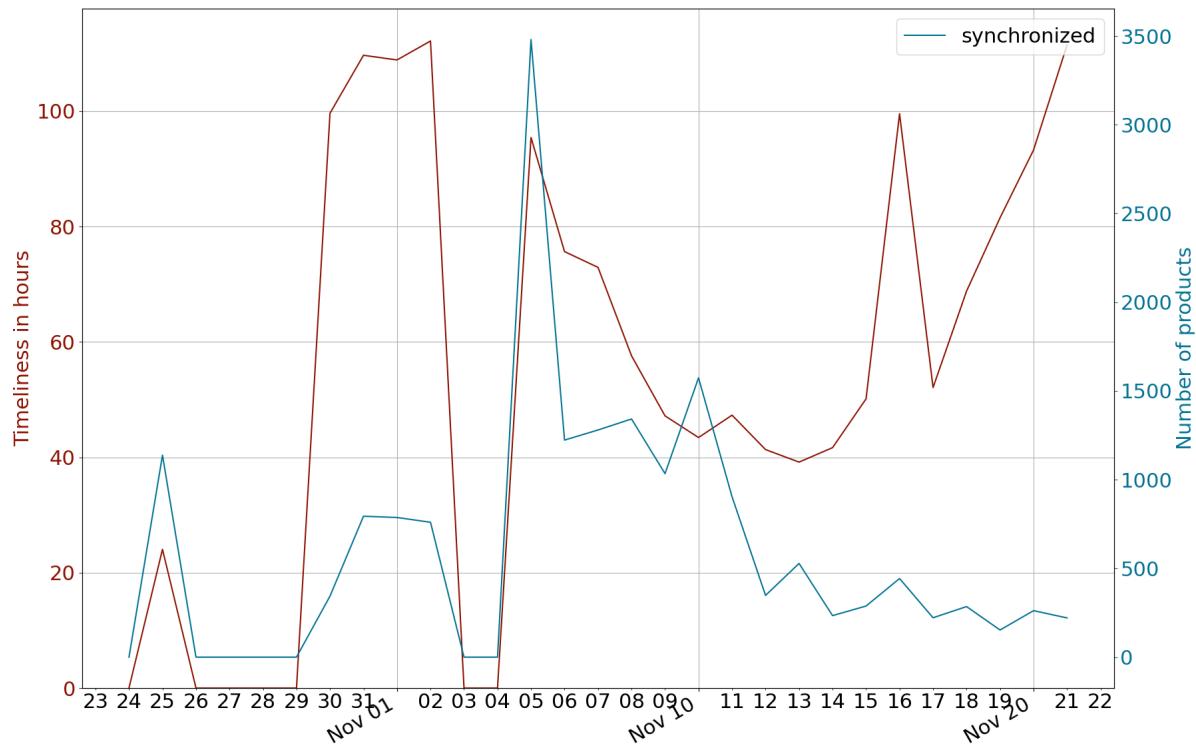
6.3 Data ingestion

In this section the time difference between sensing time and ingestion time at MET norway is assessed. The ingestion time is the time at which a Sentinel product was downloaded to MET Norway BE and so, it is automatically available in at least one of the MET Norway FEs.



The figure above shows an overall status of the Sentinel-3 synchronization between ESA datahub and MET Norway BE. The number of products synchronized and deleted are represented by the dark and light blue lines respectively. The red line represents the timeliness.

Following previous sections, the graph below shows a zoom in the last 30 days for the synchronization between ESA datahub and MET Norway BE.



A more detailed information is given in the table below where the last 30 days are assessed for products synchronized from ESA.

day	size	number	timeliness
2023-10-23	0.000000	0	0.000000
2023-10-24	0.000000	0	0.000000
2023-10-25	346.482356	1138	24.039426
2023-10-26	0.000000	0	0.000000
2023-10-27	0.000000	0	0.000000
2023-10-28	0.000000	0	0.000000
2023-10-29	0.000000	0	0.000000
2023-10-30	124.126872	344	99.647355
2023-10-31	238.660017	794	109.695162
2023-11-01	234.466822	787	108.881996
2023-11-02	221.385621	760	112.169139
2023-11-03	0.000000	0	0.000000
2023-11-04	0.000000	0	0.000000
2023-11-05	1034.358688	3480	95.438421
2023-11-06	371.465858	1223	75.661360
2023-11-07	369.733755	1280	72.923349
2023-11-08	410.696841	1342	57.593631
2023-11-09	315.738073	1034	47.182513
2023-11-10	483.842236	1574	43.427131
2023-11-11	343.474447	904	47.304579
2023-11-12	137.927769	348	41.342228
2023-11-13	196.381252	528	39.168003
2023-11-14	101.377359	234	41.673107
2023-11-15	109.933313	288	50.127621
2023-11-16	149.368705	443	99.563129
2023-11-17	68.607945	222	52.090592

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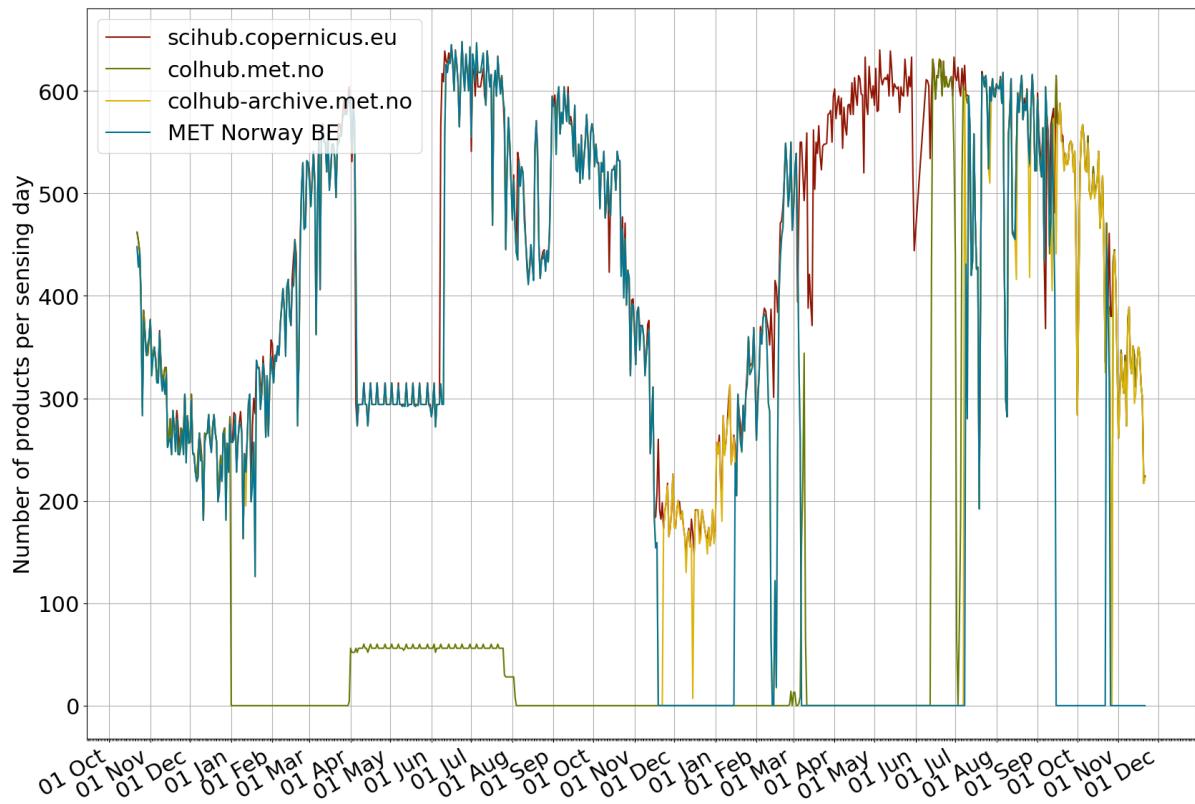
2023-11-18	80.337990	285	68.808195
2023-11-19	58.411500	153	81.526800
2023-11-20	70.028847	262	93.279097
2023-11-21	84.426507	221	111.479966

SENTINEL-5P PRODUCTS

This section shows the performance of MET Norway for Sentinel-5p products. Both, an overall status and last month status are shown below.

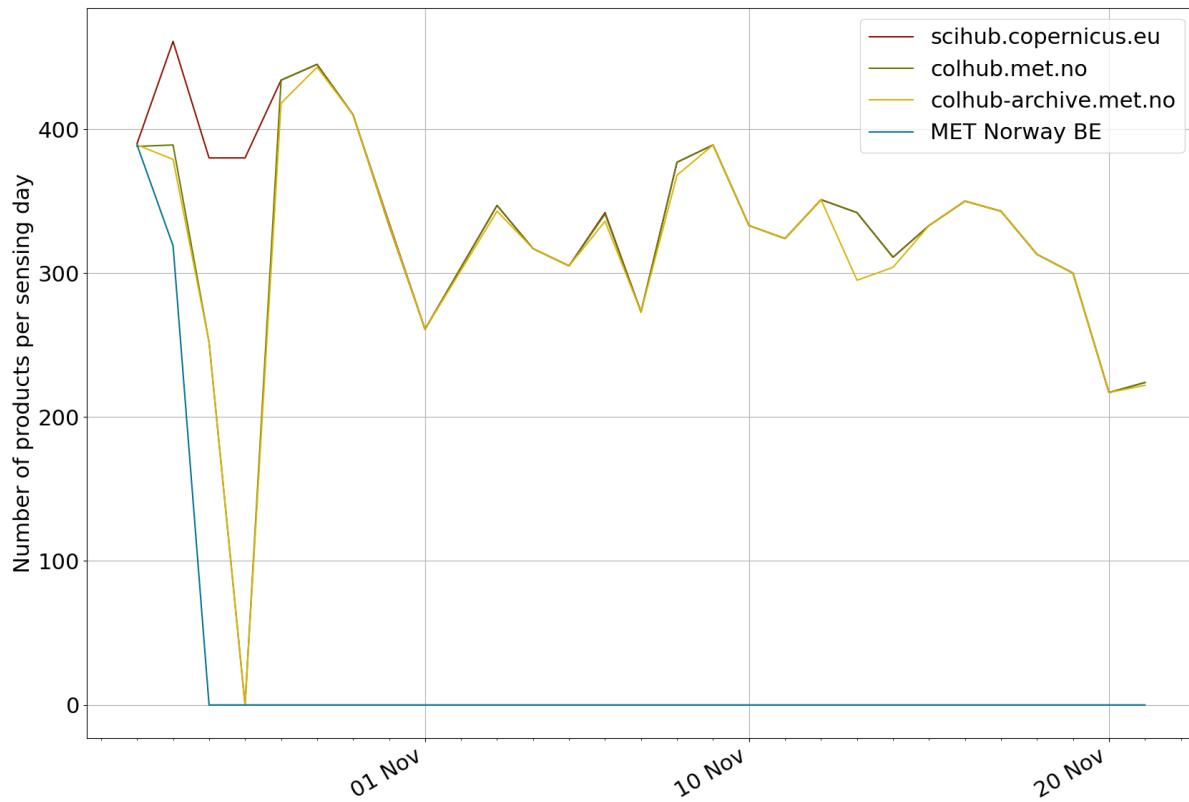
7.1 Products on portals

The following section contains an update on the Sentinel-5p products included in the different FEs and BEs.



The figure above represents the overall number of products present in the different BackEnds and FrontEnds per day for Sentinel-5p.

While the figure below shows a zoom on the last 30 days.



A 30 days table is also included for more detailed information.

sensing_date	colhub.met.no	scihub.copernicues.eu	colhub-archive.met.no	\
2023-10-22	335	335.0	325.0	
2023-10-23	471	471.0	447.0	
2023-10-24	388	390.0	389.0	
2023-10-25	389	461.0	379.0	
2023-10-26	252	380.0	252.0	
2023-10-27	0	380.0	0.0	
2023-10-28	434	434.0	418.0	
2023-10-29	445	445.0	443.0	
2023-10-30	410	410.0	410.0	
2023-10-31	333	335.0	334.0	
2023-11-01	261	261.0	261.0	
2023-11-03	347	347.0	343.0	
2023-11-04	317	317.0	317.0	
2023-11-05	305	305.0	305.0	
2023-11-06	341	342.0	336.0	
2023-11-07	273	273.0	273.0	
2023-11-08	377	377.0	368.0	
2023-11-09	389	389.0	389.0	
2023-11-10	333	333.0	333.0	
2023-11-11	324	324.0	324.0	
2023-11-12	351	351.0	351.0	
2023-11-13	342	342.0	295.0	
2023-11-14	311	311.0	304.0	
2023-11-15	333	333.0	333.0	
2023-11-16	350	350.0	350.0	

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2023-11-17	343	343.0	343.0
2023-11-18	313	313.0	313.0
2023-11-19	300	300.0	300.0
2023-11-20	217	217.0	217.0
2023-11-21	224	224.0	222.0
MET Norway BE			
sensing_date			
2023-10-22	0.0		
2023-10-23	447.0		
2023-10-24	389.0		
2023-10-25	319.0		
2023-10-26	0.0		
2023-10-27	0.0		
2023-10-28	0.0		
2023-10-29	0.0		
2023-10-30	0.0		
2023-10-31	0.0		
2023-11-01	0.0		
2023-11-03	0.0		
2023-11-04	0.0		
2023-11-05	0.0		
2023-11-06	0.0		
2023-11-07	0.0		
2023-11-08	0.0		
2023-11-09	0.0		
2023-11-10	0.0		
2023-11-11	0.0		
2023-11-12	0.0		
2023-11-13	0.0		
2023-11-14	0.0		
2023-11-15	0.0		
2023-11-16	0.0		
2023-11-17	0.0		
2023-11-18	0.0		
2023-11-19	0.0		
2023-11-20	0.0		
2023-11-21	0.0		

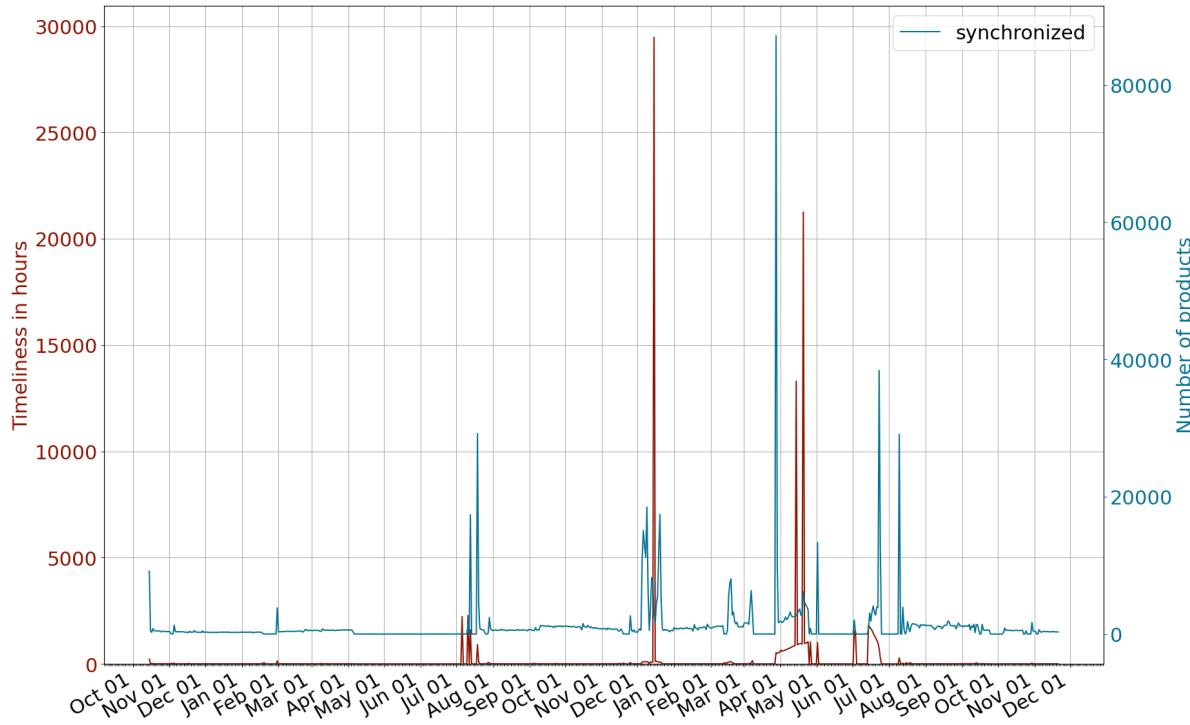
7.2 Missing products

The overall total number of Sentinel-5p products is 28265307. The number of overall Sentinel-5p missing products consists of 26023514 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

The total number of Sentinel-5p products in the last 30 days is 28259223. The number of Sentinel-5p missing products during the last 30 days consists of 26018314 images. This represents that a 0% of the total was included in MET Norway DHR, while a 100% was not included.

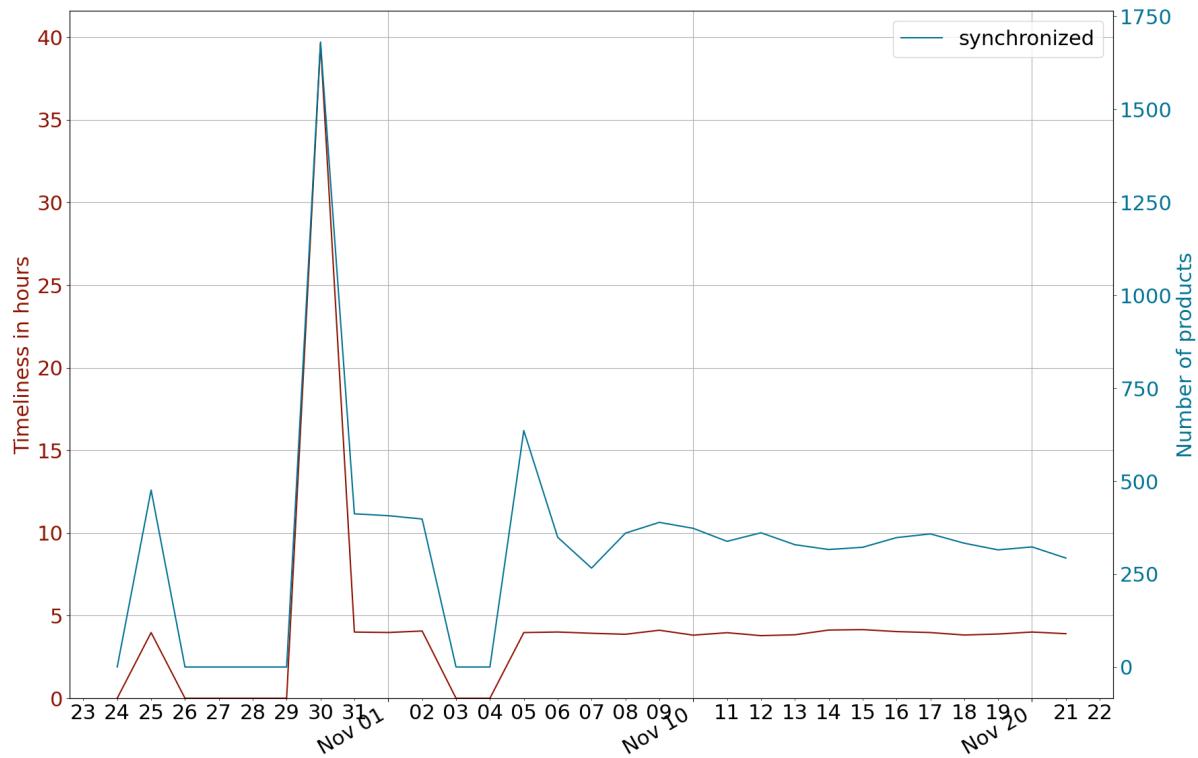
7.3 Data ingestion

In this section the time difference between sensing time and ingestion time at MET norway is assessed. The ingestion time is the time at which a Sentinel product was downloaded to MET Norway BE and so, it is automatically available in at least one of the MET Norway FEs.



The figure above shows an overall status of the Sentinel-5p synchronization between ESA datahub and MET Norway BE. The number of products synchronized and deleted are represented by the dark and light blue lines respectively. The red line represents the timeliness.

Following previous sections, the graph below shows a zoom in the last 30 days for the synchronization between ESA datahub and MET Norway BE.



A more detailed information is given in the table below where the last 30 days are assessed for products synchronized from ESA.

day	size	number	timeliness
2023-10-23	0.000000	0	0.000000
2023-10-24	0.000000	0	0.000000
2023-10-25	309.951348	476	3.973743
2023-10-26	0.000000	0	0.000000
2023-10-27	0.000000	0	0.000000
2023-10-28	0.000000	0	0.000000
2023-10-29	0.000000	0	0.000000
2023-10-30	1166.732493	1681	39.613779
2023-10-31	300.004005	412	4.004410
2023-11-01	257.539079	407	3.978727
2023-11-02	252.242853	398	4.068315
2023-11-03	0.000000	0	0.000000
2023-11-04	0.000000	0	0.000000
2023-11-05	470.735582	636	3.973466
2023-11-06	236.475745	349	4.007979
2023-11-07	204.521640	266	3.931993
2023-11-08	250.932180	360	3.871582
2023-11-09	264.428683	389	4.115448
2023-11-10	252.897862	373	3.817613
2023-11-11	243.288479	338	3.966401
2023-11-12	243.365280	361	3.789386
2023-11-13	201.783009	329	3.840849
2023-11-14	220.604011	316	4.125766
2023-11-15	236.833450	322	4.152721
2023-11-16	241.165226	348	4.034454
2023-11-17	236.936249	358	3.974665

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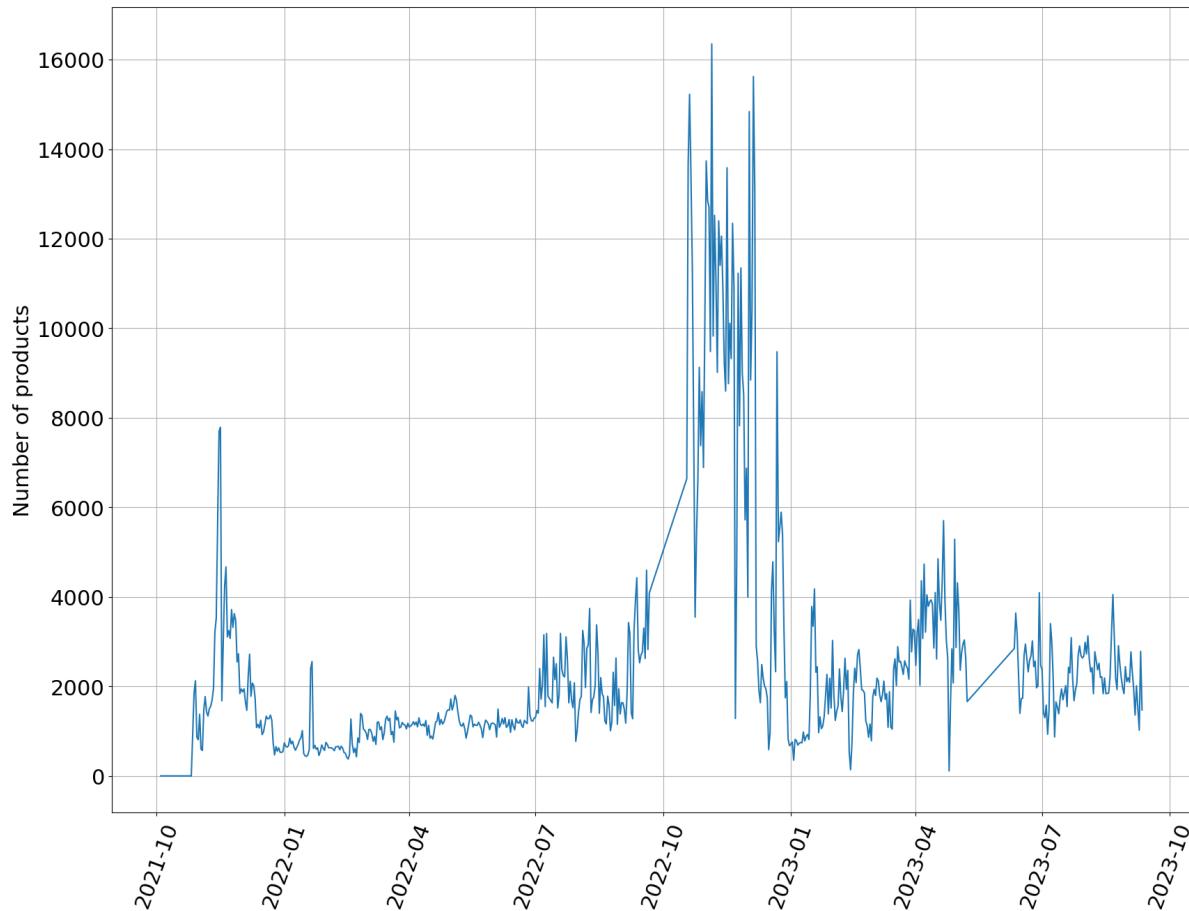
2023-11-18	223.822716	333	3.826152
2023-11-19	219.914605	315	3.886712
2023-11-20	219.014808	323	4.005817
2023-11-21	200.952476	293	3.906878

MONITORING DATA DOWNLOADS FROM COLHUB PORTALS

In this section the performance of the FrontEnds is analyzed, for both [colhub.met.no](#) and [colhub-archive.met.no](#). The FEs performance is translated as user accessibility to the data which is one of the main goals for the project.

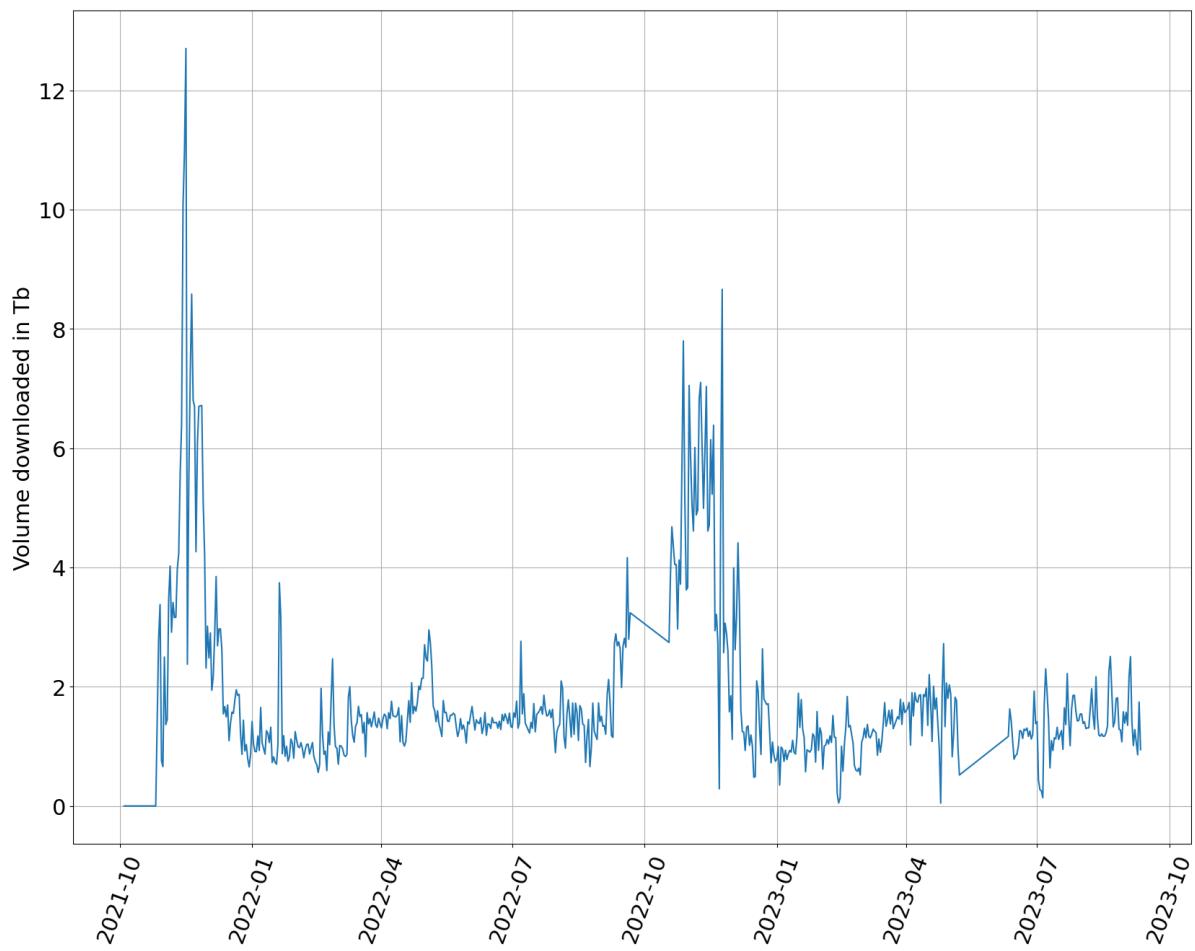
8.1 Portal: [colhub.met.no](#)

The first portal to analyze is [colhub.met.no](#). The target of the analysis is to check the amount of data downloaded by users, but also the number of users accessing the datahub. Below the historical amount of data per day is represented.



The same data is also represented below, with a difference. This time the data is not accounted by number, but by volume. Although both graphs show similar trends, they are not exactly equal due to the variability in the ratio volume per product.

For instance, the seasonality of optical products could have an impact in the total volume of products.



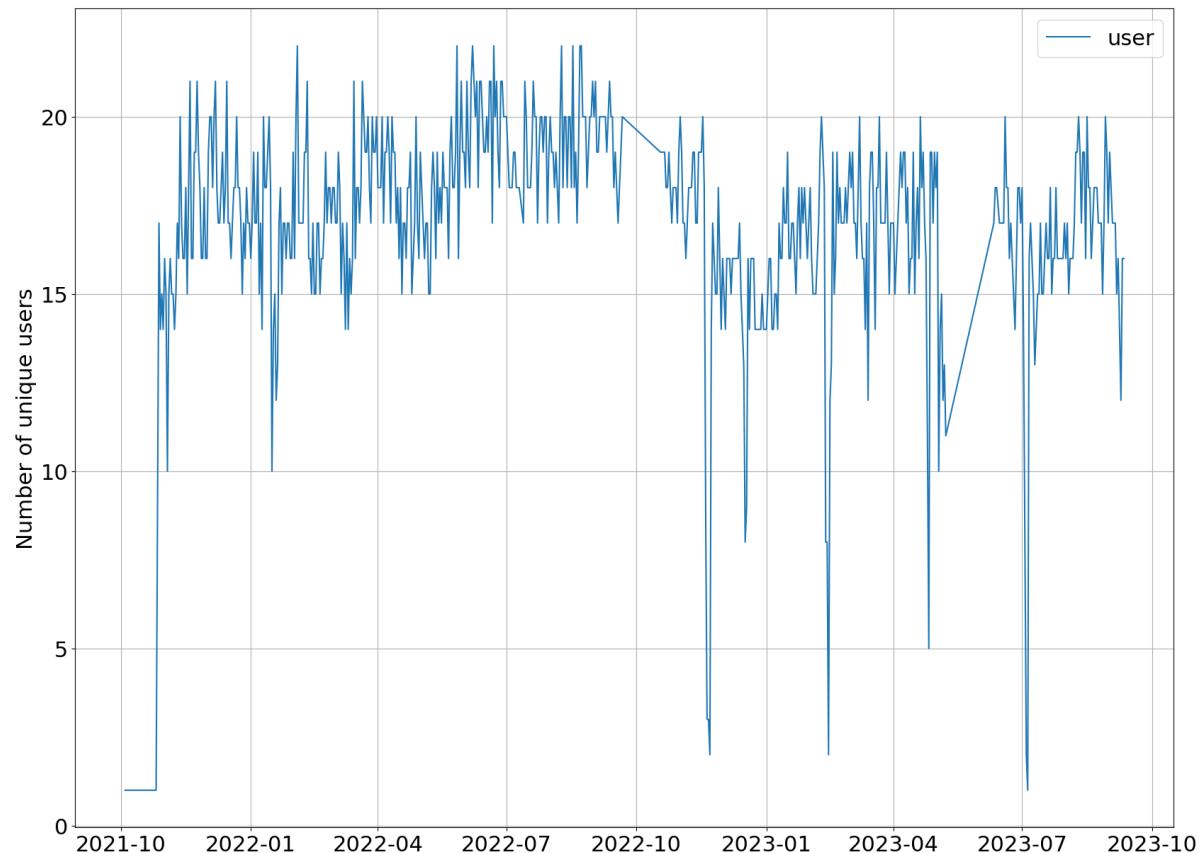
The table below is also interesting. It shows the amount of products downloaded for each the different Sentinel products. As expected, S1 and S2 are the most used Sentinels. S3 is slightly used, while S5p is not used.

satellite	product_type	
S1	GRDH	184907
	GRDM	68230
	OCN	54868
	RAW	151733
	SLC	45847
S2	MSIL1C	282758
	MSIL1C_DTERRENG	3100
	MSIL2A	755846
S3	OLCI_L1	3057
	OLCI_L2	302
	SLSTR_L1	3958
	SLSTR_L2	4
	SRAL_L1	20
	SRAL_L2	55
	SYN_L2	27
S5	NRTI_L2	3281
	OFFL_L1B	3
	OFFL_L2	4

The following table shows the total downloaded volume of data in Tb per month. Here the seasonality of some Sentinel products can affect the final numbers.

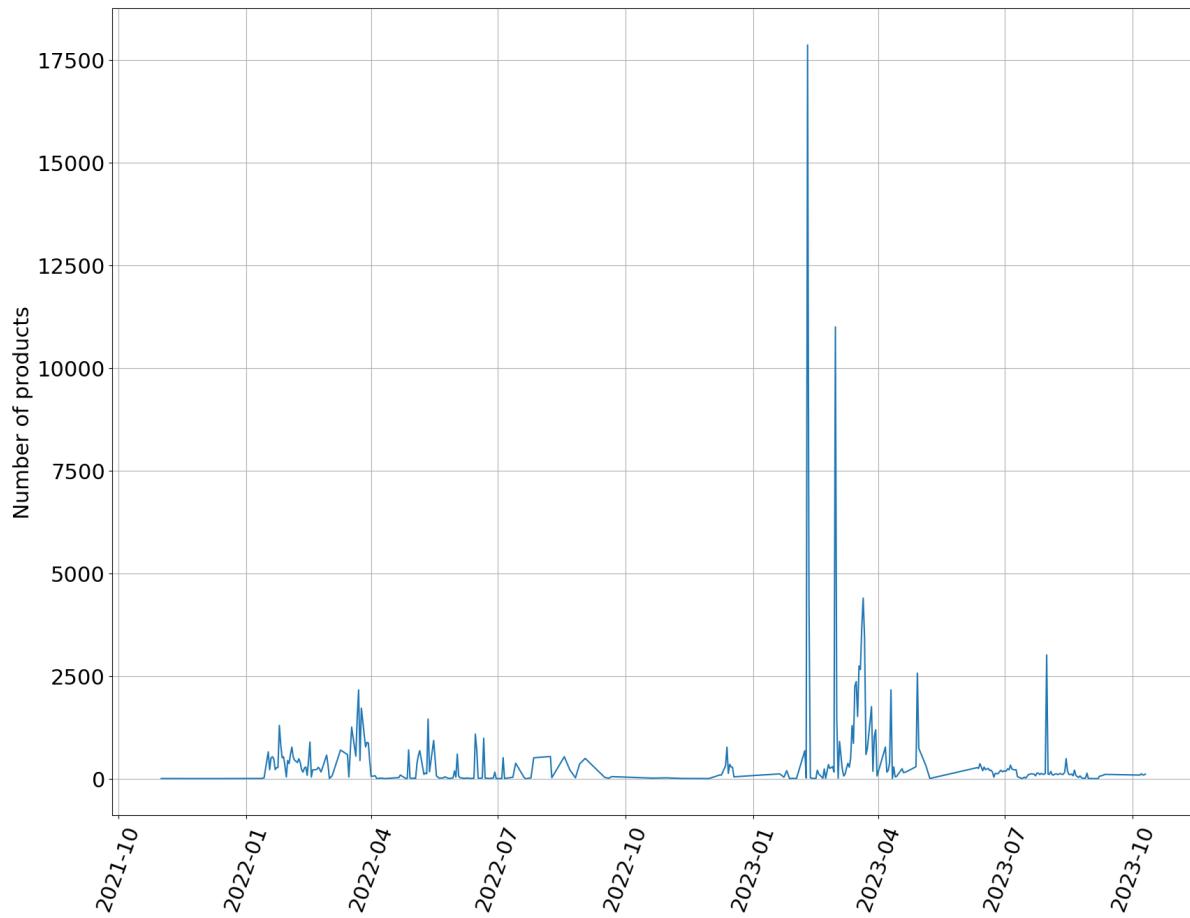
download_time	download_time	
2021	10	7.588303
	11	158.654049
	12	57.675128
2022	1	36.406545
	2	29.798405
	3	39.869718
	4	46.768604
	5	51.219186
	6	42.277098
	7	44.565096
	8	42.852304
	9	47.447532
	10	60.491409
	11	141.031091
	12	50.957670
2023	1	31.934204
	2	26.186281
	3	41.244137
	4	49.409686
	5	11.021648
	6	23.288549
	7	38.469730
	8	44.514413
	9	14.828489
		Name: size, dtype: float64

The number of users accessing and using the datahub is also important to be known. The plot below show the number of users per day. Some variability is represented in its numbers. Nevertheless, [colhub.met.no](#) is used by 15 to 20 users per day.



8.2 Portal: colhub-archive.met.no

Similar to [colhub.met.no](#), here it is presented the performance of [colhub-archive.met.no](#). First the number of products downloaded per day. As shown in the plot below, some days the number of products downloaded is null. This is a correct value which is not reflecting the performance of the FE. The archive is not as frequently accessed as [colhub.met.no](#). Only those users looking for historical data will used this portal.



As explained and shown in the previous section, the total volume downloaded is also shown in the graphic below.

```

KeyError                                                 Traceback (most recent call last)
File ~/anaconda3/lib/python3.11/site-packages/pandas/core/indexes/base.py:3802, in ...
    3801     try:
-> 3802         return self._engine.get_loc(casted_key)
    3803     except KeyError as err:
    3804         if missing_is_error:

File ~/anaconda3/lib/python3.11/site-packages/pandas/_libs/index.pxi:138, in ...
    138     if PyObjectHashTable.get_item():
-> 139         raise KeyError('size')

File pandas/_libs/hashtable_class_helper.pxi:5745, in pandas._libs.hashtable.
    5744     if PyObjectHashTable.get_item():
-> 5745         raise KeyError('size')

File pandas/_libs/hashtable_class_helper.pxi:5753, in pandas._libs.hashtable.
    5752     if PyObjectHashTable.get_item():

KeyError: 'size'

The above exception was the direct cause of the following exception:
```

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```
KeyError
Cell In[14], line 2
    1 # Volume downloaded per day (in Tb)
----> 2 total = nbs_AOI.groupby(nbs_AOI.index.date).sum(numeric_only=True) ['size']/
  ↳1024/1024/1024
    3 total.plot(ylabel='Volume downloaded in Tb', rot=70)
    4 plt.grid(True)

File ~/anaconda3/lib/python3.11/site-packages/pandas/core/frame.py:3807, in_
  ↳DataFrame.__getitem__(self, key)
  3805 if self.columns.nlevels > 1:
  3806     return self._getitem_multilevel(key)
-> 3807 indexer = self.columns.get_loc(key)
  3808 if is_integer(indexer):
  3809     indexer = [indexer]

File ~/anaconda3/lib/python3.11/site-packages/pandas/core/indexes/base.py:3804, in_
  ↳Index.get_loc(self, key, method, tolerance)
  3802     return self._engine.get_loc(casted_key)
  3803 except KeyError as err:
-> 3804     raise KeyError(key) from err
  3805 except TypeError:
  3806     # If we have a listlike key, _check_indexing_error will raise
  3807     # InvalidIndexError. Otherwise we fall through and re-raise
  3808     # the TypeError.
  3809     self._check_indexing_error(key)

KeyError: 'size'
```

It is still interesting to see the number of products downloaded per product type. As shown in the previous section, S1 and S2 still are the most popular Sentinels.

The table below shows the monthly retrieved volume of data in Tb.

The last graphic show the number of users accessing and downloading data from the portal. Again, the discontinuity in numbers of users it is not a sign of the portal performance.

DATA VOLUMES FOR NBS

```
OptionError                                         Traceback (most recent call last)
Cell In[2], line 2
      1 # show all rows, all columns
----> 2 pd.set_option("max_rows", None)
      3 pd.set_option("max_columns", None)
      4 pd.set_option('max_colwidth', None)

File ~/anaconda3/lib/python3.11/site-packages/pandas/_config/config.py:263, in __
 CallableDynamicDoc.__call__(self, *args, **kwargs)
    262     def __call__(self, *args, **kwargs) -> T:
--> 263         return self._func_(*args, **kwargs)

File ~/anaconda3/lib/python3.11/site-packages/pandas/_config/config.py:156, in __
 set_option(*args, **kwargs)
    153     raise TypeError(f'__set_option() got an unexpected keyword argument "'
--> 154     kwargs}"')
    155     for k, v in zip(args[::2], args[1::2]):
--> 156         key = _get_single_key(k, silent)
    158         o = _get_registered_option(key)
    159         if o and o.validator:

File ~/anaconda3/lib/python3.11/site-packages/pandas/_config/config.py:123, in __
 get_single_key(pat, silent)
    121     raise OptionError(f"No such keys(s): {repr(pat)}")
    122 if len(keys) > 1:
--> 123     raise OptionError("Pattern matched multiple keys")
    124 key = keys[0]
    126 if not silent:

OptionError: Pattern matched multiple keys
```

Satellite data storage requires an important amount of disk space, especially high resolution products such as the ones produced by the Sentinel constellation. This also represents an economical cost. Hence, it is very important to keep track of the total volume of data stored at MET Norway premises. In this section those numbers are shown.

9.1 Volumes for AOI backends

Two type of products can be differentiated, products acquired from ESA datahub which keep the original format and Sentinel products transformed into NetCDF. Those directly acquired from ESA are stored at MET Norway BE for the AOI. Later on, they are made available to users through colhub-archive and colhub FEs.

In the graphic above the volume of data per day in Gb is shown for the last year. Here we can observe seasonality due to optical sensor products. The table below shows the same information for the last 30 days.

9.2 Volume for netcdf products

The products converted to NetCDF are S1 and S2 products. These Sentinel datasets are served as SAFE format by ESA. This is not always convenient for users. Therefore as part of the NBS project, one of the MET Norway tasks as operator is to translate those products into NetCDF.

In the graphic above the volume of NetCDF data per day in Gb is shown for the last year. Here we can observe seasonality due to optical sensor products. The table below shows the same information for the last 30 days.

9.3 Totals

In the graphic above the total volume of data per day in Gb is shown for the last year. Here we can observe seasonality due to optical sensor products again. The table below shows the same information for the last 30 days.

**CHAPTER
TEN**

PREVIOUS REPORTS

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