



RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

www.onera.fr



RÉPUBLIQUE
FRANÇAISE

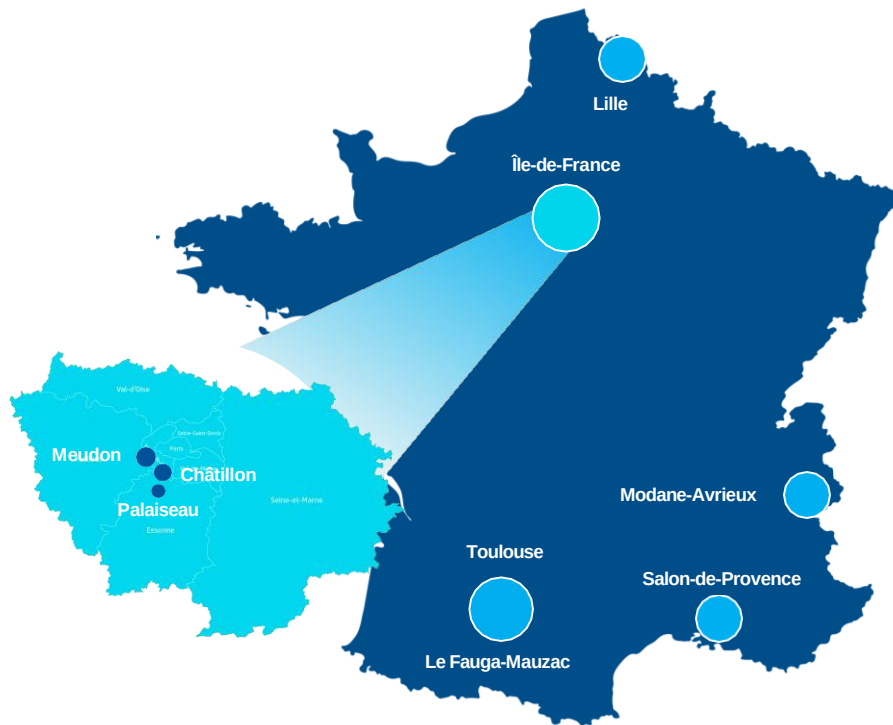
*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

La télédétection à l'ONERA

Office National d'Etudes et de Recherches Aérospatiales



Premier acteur français de la recherche aérospatiale

Innover pour l'industrie



Être expert pour l'État



Préparer l'avenir



**RÉPUBLIQUE
FRANÇAISE**

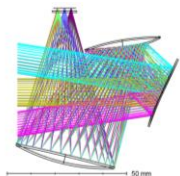
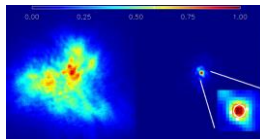
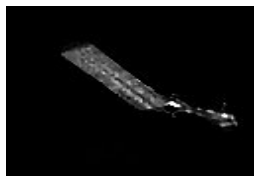
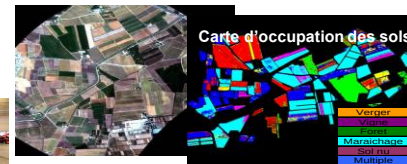
*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

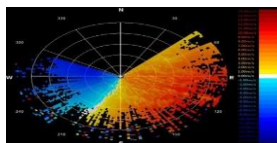
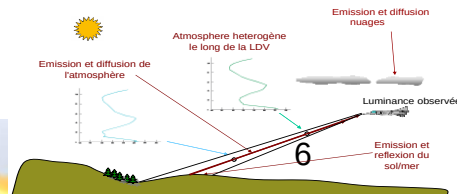
Département d'Optique et Techniques Associées

Les activités du DOTA

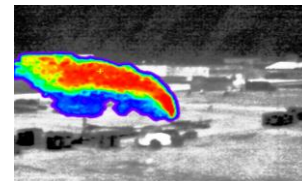


**Modèles
Traitements
Bases de données**

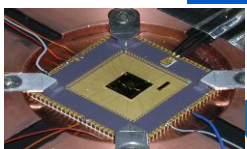
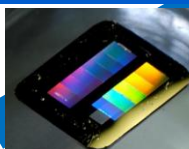
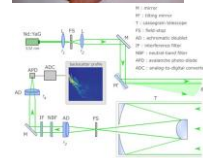
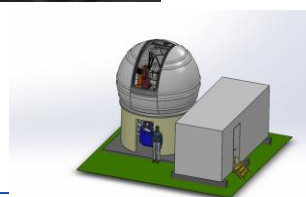
**Campagnes
de mesures**



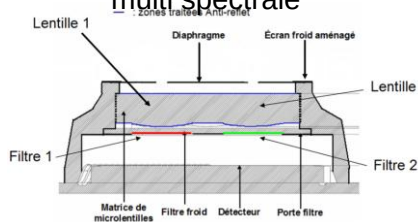
Systèmes optiques



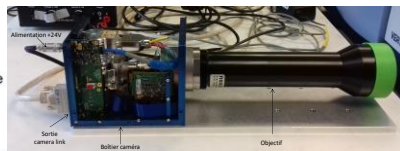
Technologie



Conception d'une caméra multi spectrale



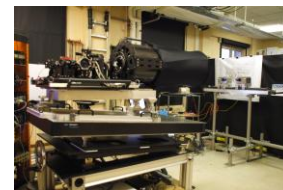
Caméra multi spectrale 2 – 5 μm



Spectro imageur aéroporté Sieleters



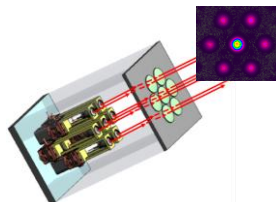
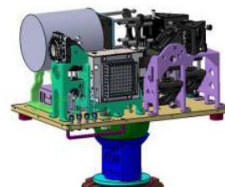
Banc de télécom optiques Feedelio



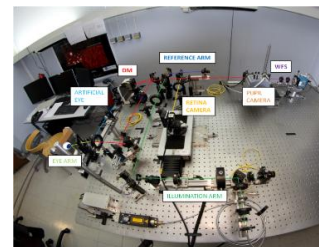
Caméra multi spectrale Simagaz (7 – 8 μm)



Juxtaposition de pupilles pour la combinaison cohérente

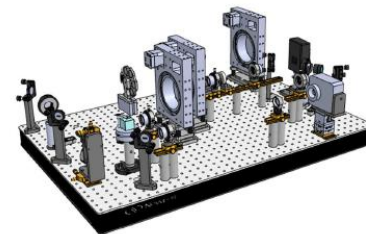


Lidar Colibri
Mesures des suies

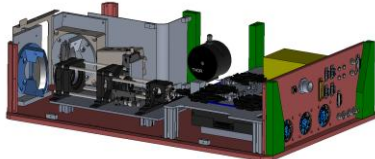
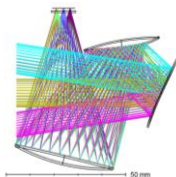


Banc pour la détection précoce de la DMLA

Banc d'émulation de conditions atmosphériques Picolo



CAO du Lidar Will 2 Détection des vortex – vol en formation



conception optique bispectrale freeform



Démonstrateur de combinaison cohérente
Lasbe



Instrument Sphère équipé du système d'Optique Adaptative sur le VLT

Station de télécom optiques sol satellites Feelings

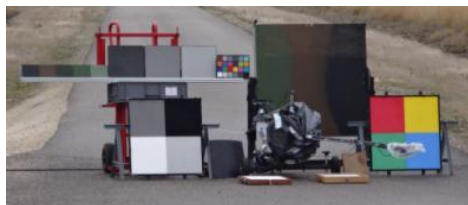


Systèmes optiques

Expérience Feedelio – Mont Teide



Radiométrie visible couleur



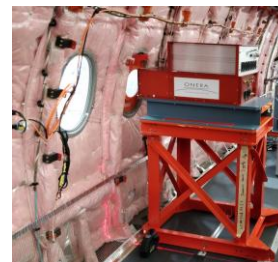
Sysiphe 2019



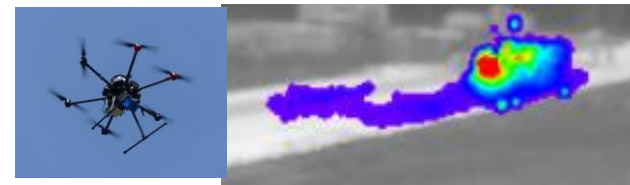
Campagne Magic à Kiruna
2021



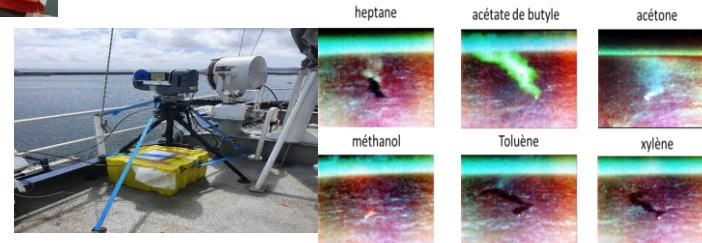
Lidar Will 2
Airbus A350



Détection de gaz depuis un drone



Détection de polluants évaporant
au-dessus de la mer



Campagnes de mesures



Mesure de signature sur un
propulseur statique



Lidar LIVE dans ATR42

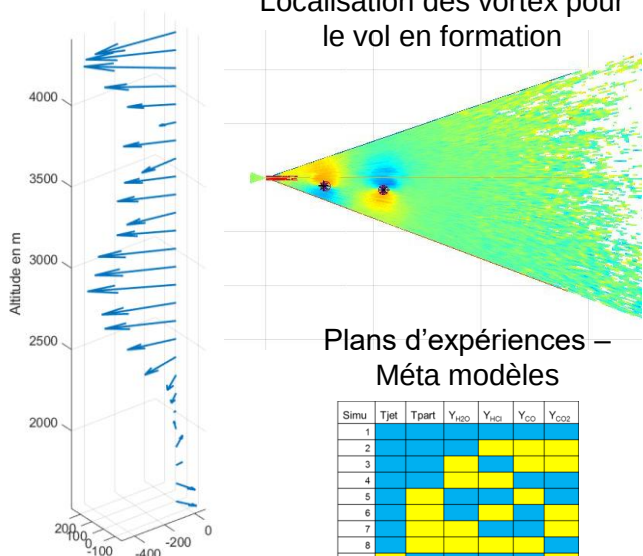


Acquisition d'images réalistes dans le visible



Image HS MWIR fausse couler (Sysiphe)

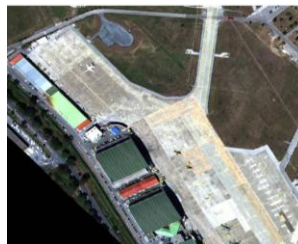
Localisation des vortex pour le vol en formation



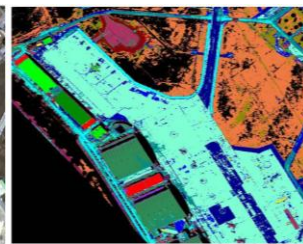
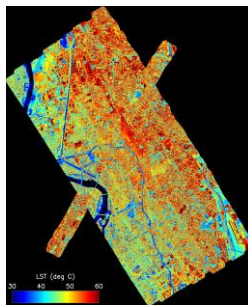
Reconstruction du profil de vent

Plans d'expériences – Méta modèles

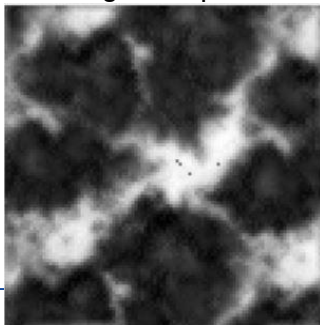
Simu	Tjet	Tpart	Y _{V00}	Y _{V01}	Y _{CO}	Y _{CO2}
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						



Classification à partir d'images Hyperspectrales (Sysiphe)



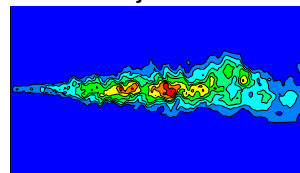
Imagerie multispectrale infrarouge aéroportée



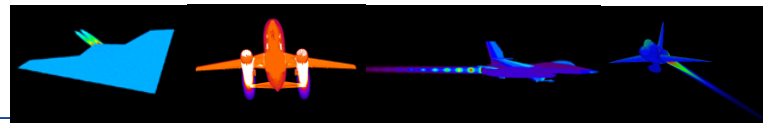
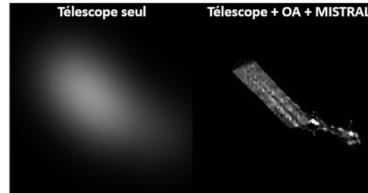
Modélisation fonds nuageux IR

Modèles Traitements Bases de données

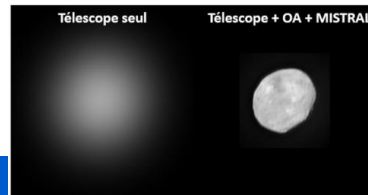
Modélisation signature de jets



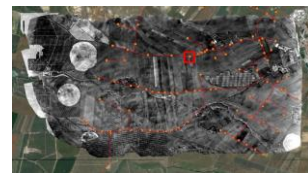
Modélisation de signature IR aéronaves



SSA : MEO (1.5m) + ODISSEE + MISTRAL

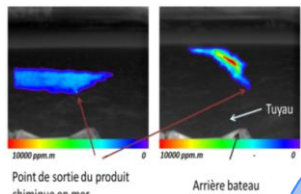


Astronomie : VLT (8m) + SPHERE-ZIMPOL + MISTRAL
Déconvolution d'images corrigées par OA



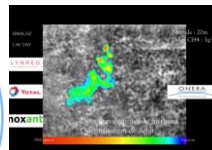
Cartographie d'humidité des sols

Unité Propriétés Optiques des Scènes : Télédétection optique passive



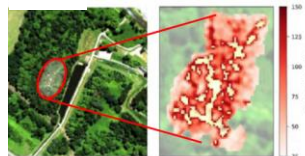
Détection de produits chimiques en mer, Crédit : P-Y Foucher, Projet CAGIRE (ONERA-CEDRE-CEPPOL)

Atmosphère
Dynamique des masses d'air, gaz, aérosols



Quantification de gaz, Simagaz sur drone, UAV Days 2020. Crédit : S. Doz, P-Y Foucher, DOTA/POS

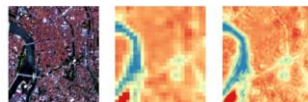
Milieu aquatique
Mers, zones côtières, eaux continentales



Détection de végétation contaminée par des métaux, Crédit : S. Fabre, Projet NAOMI (ONERA-TOTAL)

Végétation
Discrimination des espèces, santé et stress

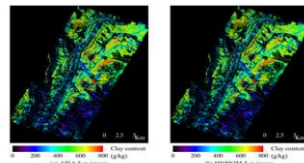
Sol nu
Composition, humidité de surface, rugosité



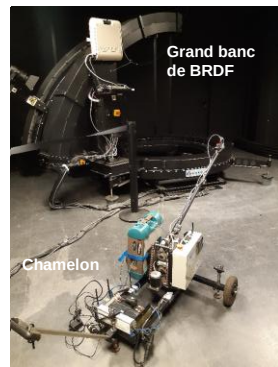
Démélange image IRT à 90 m > 30 m avec image visible à 10 m. Crédit : A. Michel, DOTA/POS

Environnement

Milieu urbain
Température de surface, cartes des sols/matériaux



Sensibilité à la résolution spatiale de l'évaluation du taux d'argile. Crédit : C. Gomez, LISAJH, R. Oltra Carrio, ONERA



Instrumentation & Traitements



Département Electromagnétisme et Radar

SETHI NG

nicolas.castet@onera.fr

*Plateforme expérimentale
aéroportée radar et optique,
multispectrale et multimode*



Falcon 20 (AVdef)

BUSARD

jean-francois.nouvel@onera.fr

*Plateforme de recherche
ultra-légère pour le développement
de nouveaux systèmes de drones*



Stemme S10-VXT (ONERA)

SAR-LIGHT

nicolas.castet@onera.fr

*Capteur compact sur drone
conçu pour la recherche et le
développement de radars imageurs*



DJI M600 (ONERA)



Falcon 20
Certification EASA
Altitude max 30 000 ft
Autonomie 2h40

Qu'est-ce que SETHI NG ?

C'est un système aéroporté dédié à l'imagerie composé de deux pods installés sous les ailes d'un Falcon 20 opéré par la société AVDEF, il intègre des capteurs SAR et optroniques.

Il permet une large gamme d'applications :

- imagerie radar à longue distance (> 70 km), à ultra-haute résolution (centimétrique), et/ou circulaire
- capacité de pénétration dans le sol et sous le feuillage
- détection de cibles mobiles (GMTI, STAP)
- polarimétrie, tomographie, interférométrie, détection de changements...

Secteurs d'activités

- Défense : conception de capteurs avancés pour des applications stratégiques
- Sécurité : détection de changements et de cibles mobiles
- Environnement : surveillance sur très grande zone, base de données de référence, usage international (certification)

Les plus du système SETHI NG

- Capacités multi-fréquences (bandes P-UHF, L, X, Ku)
- Capacités polarimétriques, interférométriques et MTI
- Synergie radar/optronique avec des caméras visible et hyperspectrales
- Modes de visées fixes ou par désignation d'objectif



bandes X/Ku + L polarimétrique
caméra optique



bande UHF
polarimétrique
caméra hyperspectrale
bande X ATi
interférométrie cross-track



bande X UHF
désignation d'objectif



bande X
MIMO (4 voies)



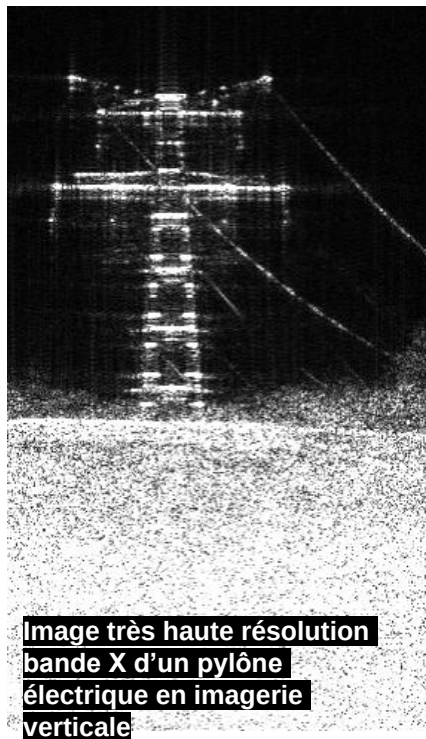
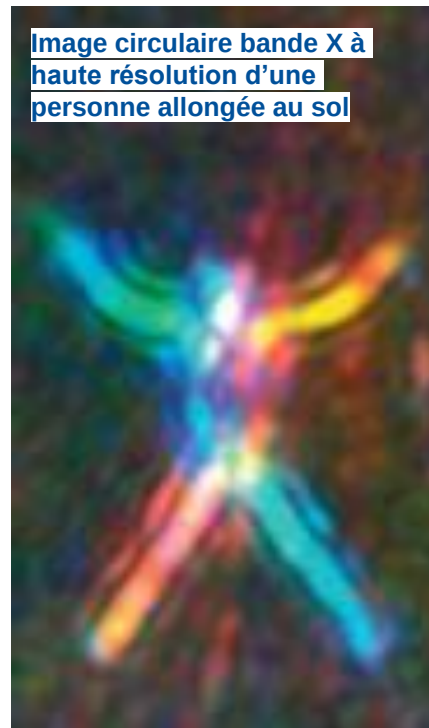
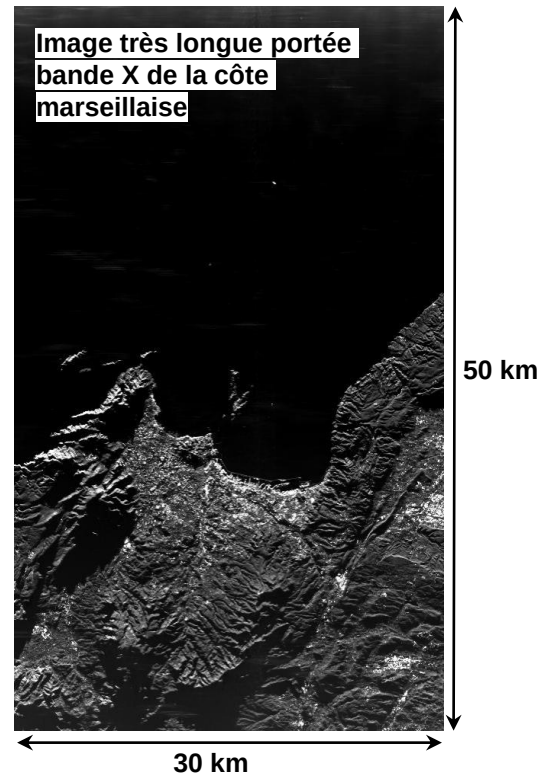
exemples de configurations (parmi les 16 certifiées)

*Une plateforme modulaire et évolutive
« plug and play » adaptable aux
besoins*

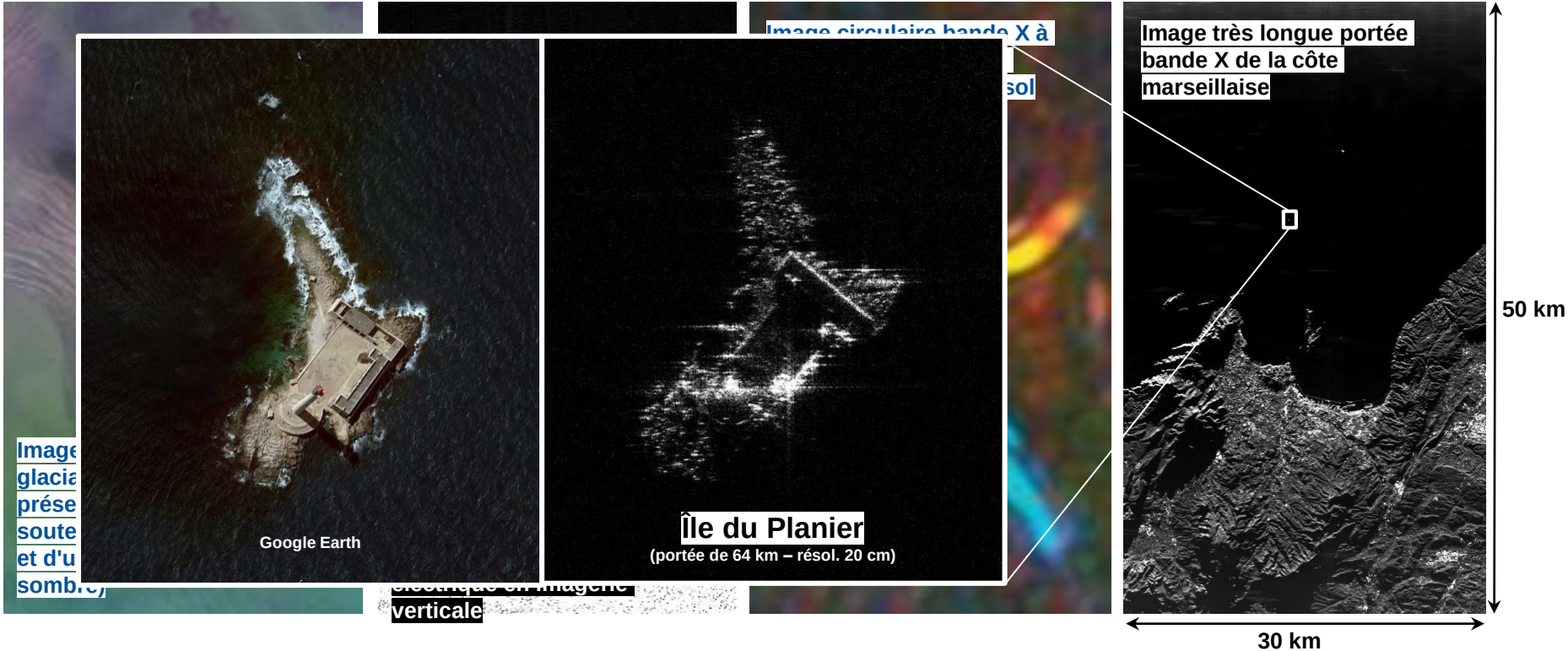


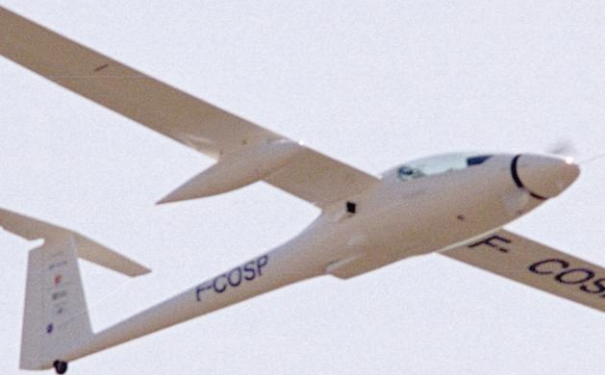
**2 pods simultanés, 3,3 m de long, 53 cm de
diamètre, 190 kg de capteur max.**

Depuis 2009, SETHI a réalisé de nombreuses campagnes en France et à l'international : Guyane (2009), Suède (2010), Tunisie (2010), Gabon (2015), Norvège (2015), Espagne (2017), Groenland (2018) et 8 campagnes en France depuis 2019.



Depuis 2007, SETHI a réalisé de nombreuses campagnes en France et à l'international :
Guyane (2009), Suède (2010), Tunisie (2010), Gabon (2015), Norvège (2015), Espagne (2017) , Groenland (2018) et 8 campagnes en France depuis 2019.





Stemme S10-VXT
Altitude 300 m à 4 000 m
Vitesse 180 km/h
Autonomie 5h

Qu'est-ce que BUSARD ?

C'est un système éprouvé, flexible et performant composé de deux nacelles compactes installées sous les ailes d'un moto-planeur STEMME S10-VT opéré par l'ONERA, il intègre des capteurs SAR et optroniques.

Il permet d'explorer des concepts variés :

- imagerie radar bistatique (avec un émetteur aérien ou spatial)
- imagerie radar interférométrique pour la mesure altimétrique
- capacité de pointage de l'antenne en temps réel (spotlight, modes glissants)
- polarimétrie, imagerie circulaire, détection de changement...

Secteurs d'activités

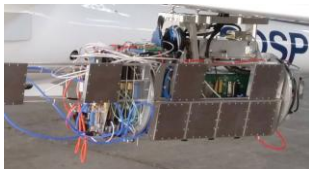
- Défense : renseignement d'origine électromagnétique, collecte de données
- Sécurité : validation de nouveaux concepts pour la surveillance aérienne (drones, aéronefs légers)
- Recherche : banc d'essai pour la preuve de concepts

Les plus du système BUSARD

- Capacités multi-fréquences (bandes L, S, X, Ka)
- Capacités polarimétriques, interférométriques et MTI
- Synergie radar/optronique avec des caméras IR et hyperspectrales
- Modes de visées fixes ou par désignation d'objectif



bandes L,
S
radar
passif



bande L
MIMO (4
voies)



bandes Ka, X



bande X
désignation d'objectif

caméras
hyperspectrales en
visée nadir

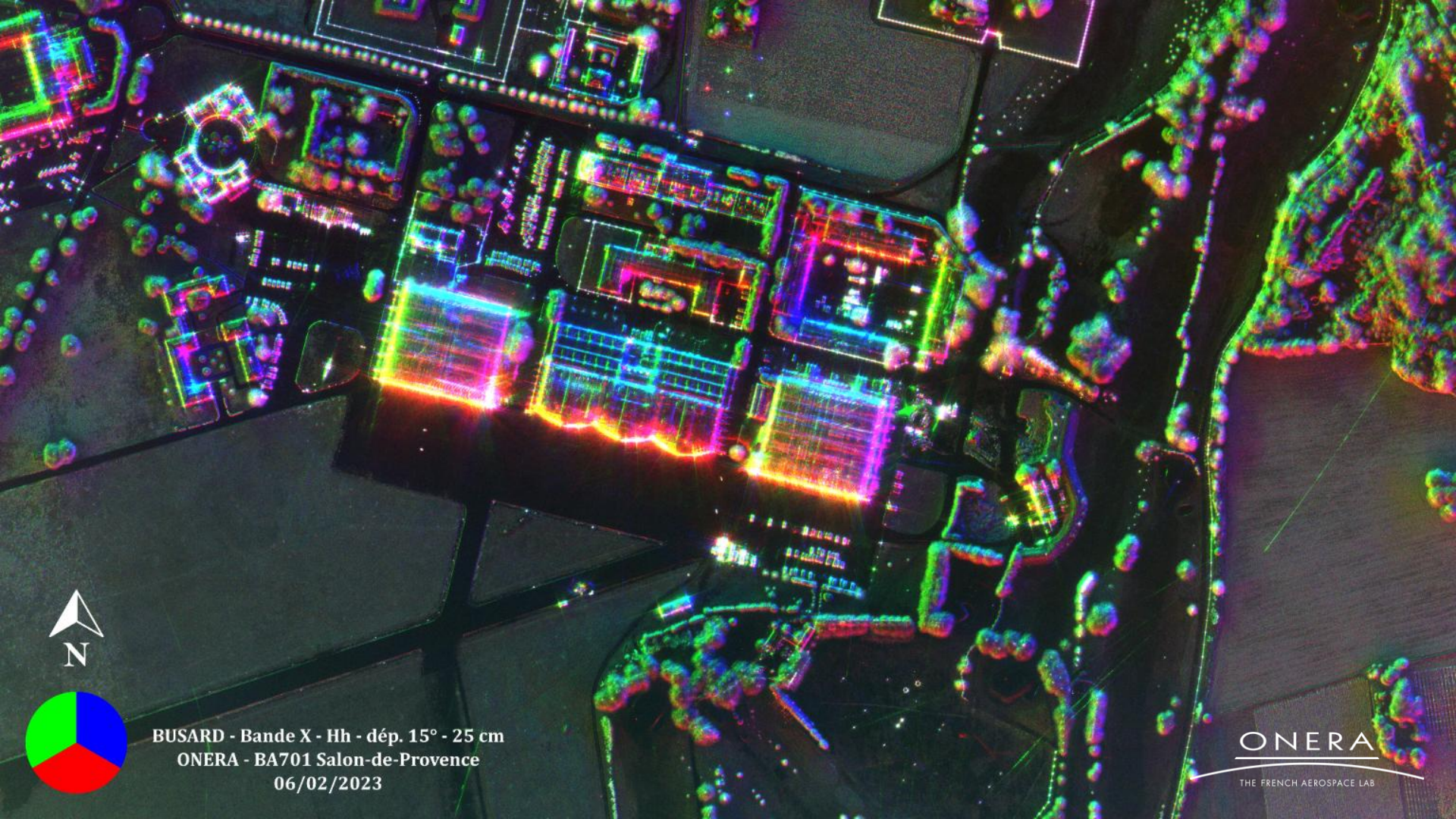


exemples de configurations (parmi les 8 exploitées)

*Un banc de test pour les vols d'essais
de charges utiles compactes*



*2 pods simultanés, 2 m de long, 36 cm de
diamètre, 60 kg de capteur max.*



BUSARD - Bande X - Hh - dép. 15° - 25 cm
ONERA - BA701 Salon-de-Provence
06/02/2023

ONERA

THE FRENCH AEROSPACE LAB

Image bistatique TSX/BUSARD visée
frontale
05/07/2024

Image bistatique TSX/BUSARD
28/05/2024

ONERA

THE FRENCH AEROSPACE LAB

SAR-LIGHT

nicolas.castet@onera.fr



DJI M600
Altitude 5 m à 120 m
Vitesse 1 à 12 km/h
Autonomie 20 min

Qu'est-ce que SAR-LIGHT ?

C'est une plateforme aéroportée dédiée à la télédétection, compacte, facile à déployer, faible coût. Ses capteurs SAR embarqués pèsent moins de 6 kg pour un fonctionnement autonome, sans fil, sur un drone DJI M600 opéré par l'ONERA.

Ce moyen permet une large gamme d'applications :

- imagerie radar à haute résolution (jusqu'à ≈ 8 cm)
- capacité multi-fréquences
- capacité de pénétration dans le sol et sous le feuillage
- capacité de pointage de l'antenne en temps réel (spotlight, modes glissants)
- multi-statisme, polarimétrie, imagerie circulaire, détection de changement...

Secteurs d'activités

- Défense : renseignement – mesures de signatures
- Sécurité : détection d'activités sur une zone d'intérêt
- Environnement : cartographie, discrimination des surfaces

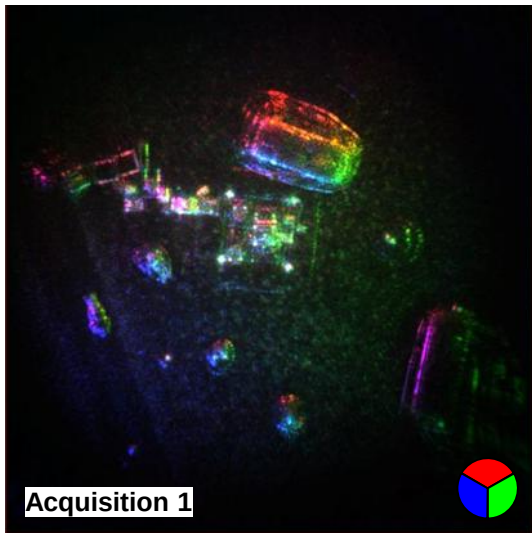
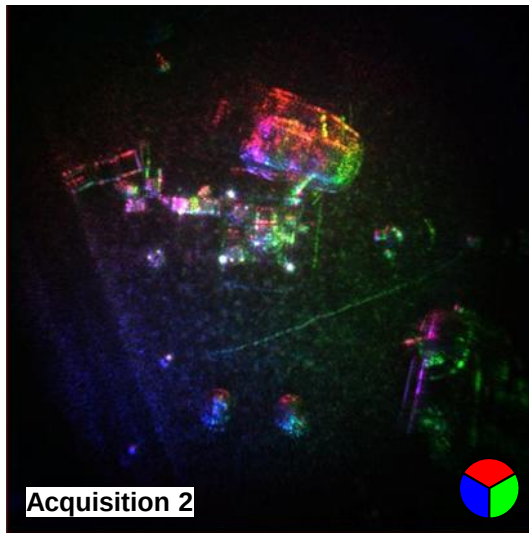
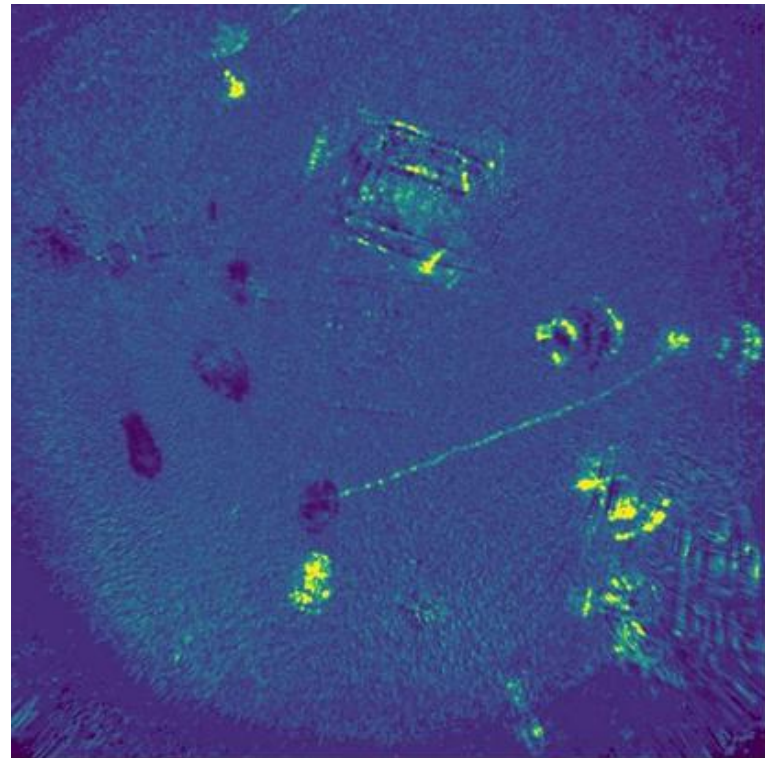
Les plus du système SAR-Light

- Capacités multi-fréquences (bandes L/UHF, C, X, Ku), polarimétriques
- Modes de visées fixes ou par désignation d'objectif



*Une plateforme compacte, faible coût
et facile à déployer pour une imagerie
radar de haute résolution*





Détection de changement en bande X sur scène complexe par mesures circulaires



RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

Département Traitement de l'information et Systemes

ONERA



Ce document est la propriété de l'ONERA. Il ne peut être communiqué à des tiers et/ou reproduit sans l'autorisation préalable écrite de l'ONERA, et son contenu ne peut être divulgué.
This document and the information contained herein is proprietary information of ONERA and shall not be disclosed or reproduced without the prior authorization of ONERA.

Sea ice

Flora Weissgerber ONERA, DTIS, SAPIA

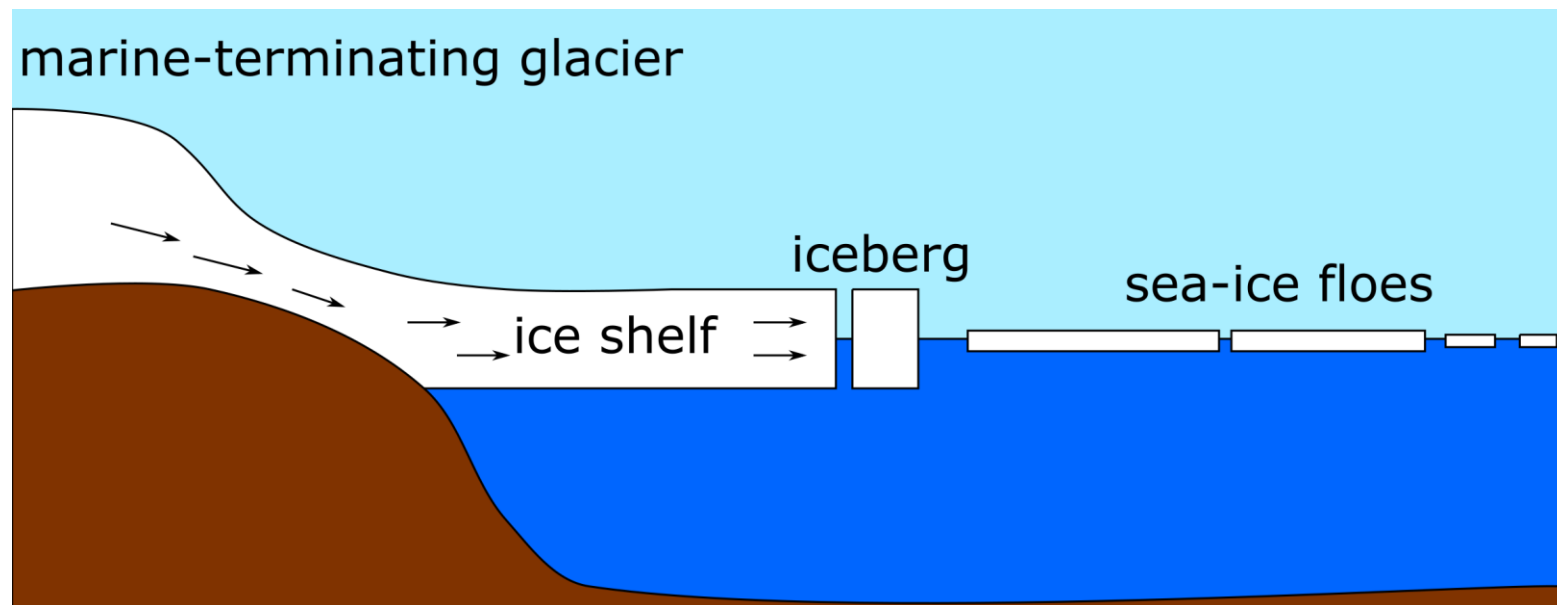
Houda Hassini, ONERA (postdoc)

Michelangelo Mussini , ONERA (PhD candidate)

Laura Orgambide , ONERA and CNES (PhD candidate)

Etienne Sénigout, ONERA (intern)

Sea ice



Sea ice = floes + leads

Seasonal: thermodynamic processes and dynamic processes (drift)

Sea ice thickness, an important climate variable



Arctic experiences drastic changes due to climate warming

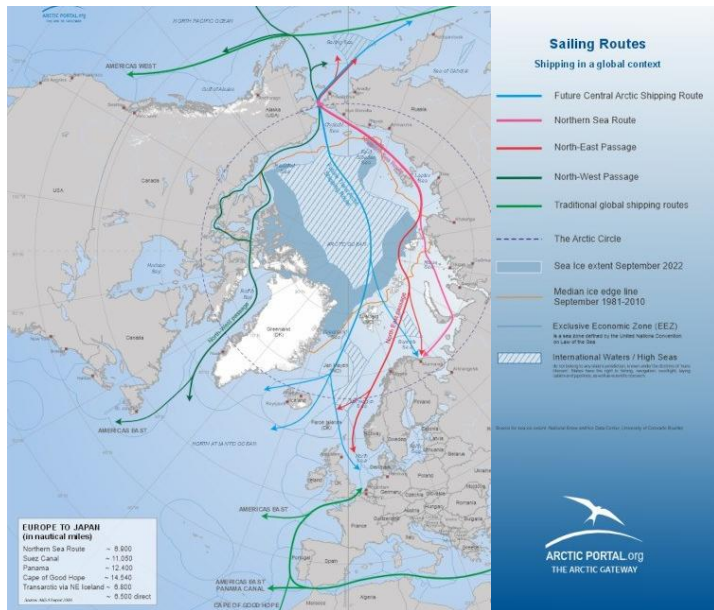
Sea Ice reduces this change:

- High albedo: limit ocean warming
- Insulates the atmosphere from the ocean

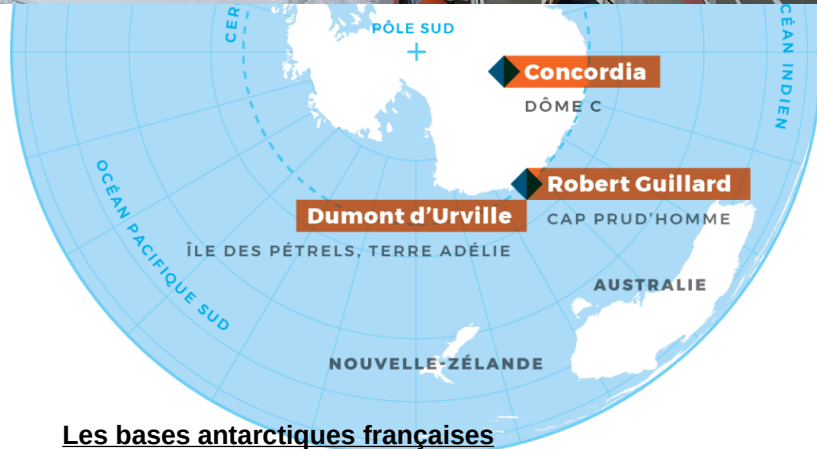
Interaction with models:

- Models need observations to be validated
- Observation errors need to be decreased for SIT to be assimilated in models

Navigation in the poles



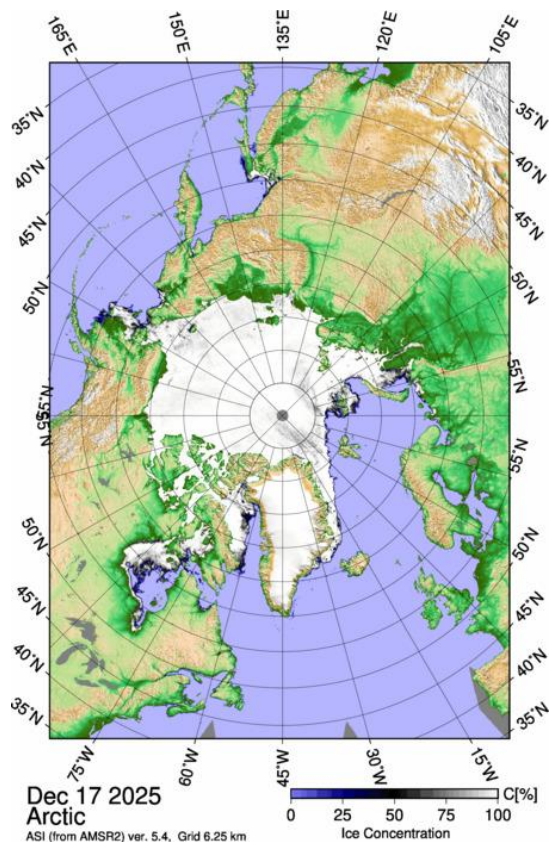
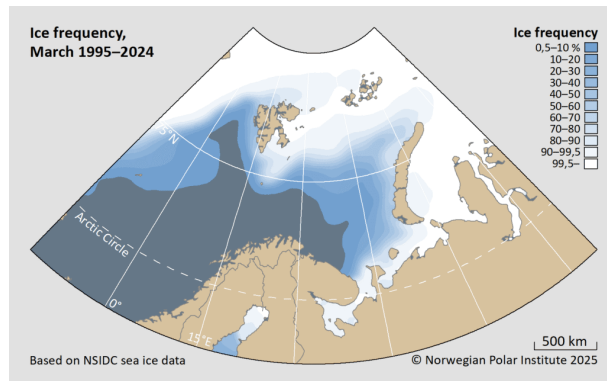
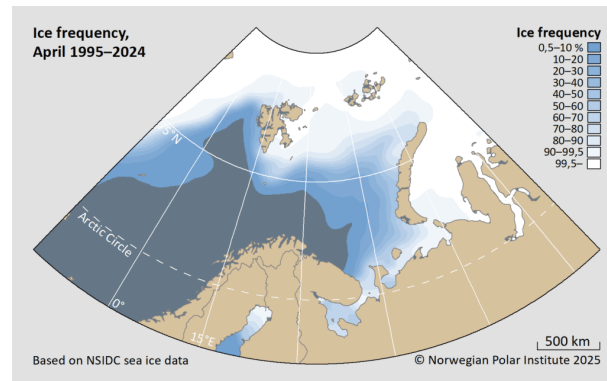
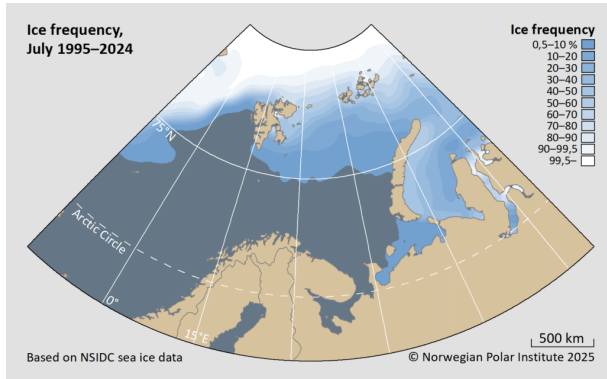
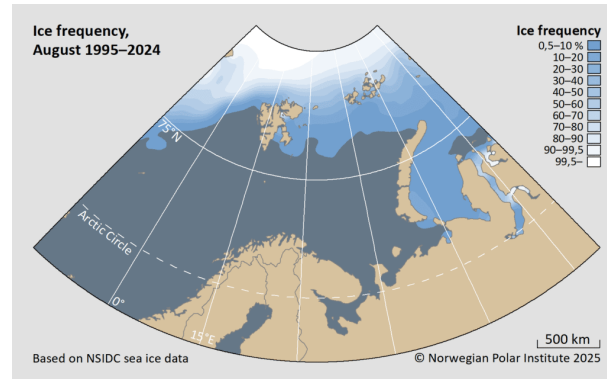
Ravitaillement de la base Dumont d'Urville par l'Astrolabe



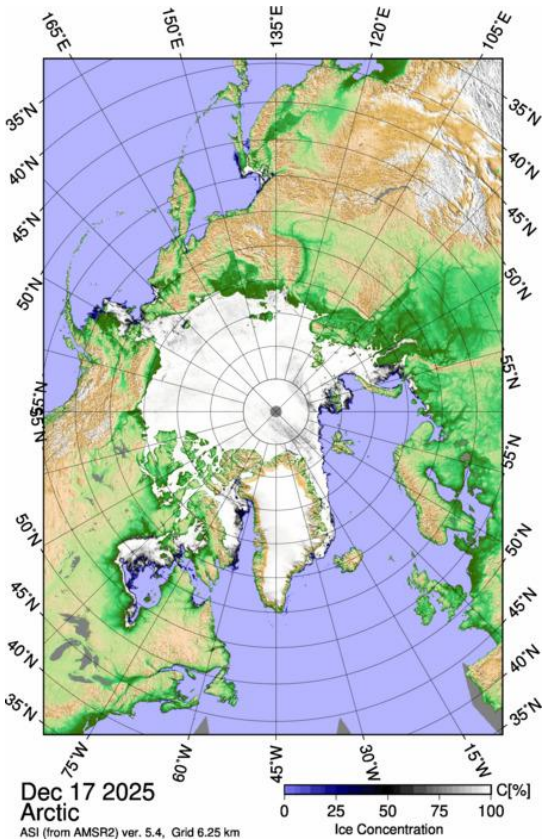
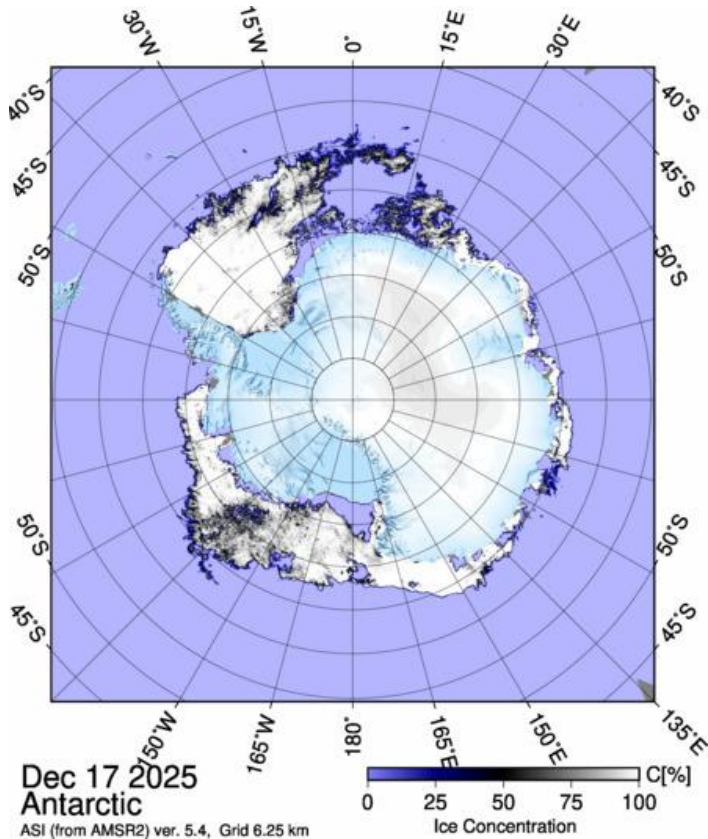
ICEX : Opération biannuelle de l'armée américaine en Arctique

The pack ice VS the marginal ice zone (MIZ)

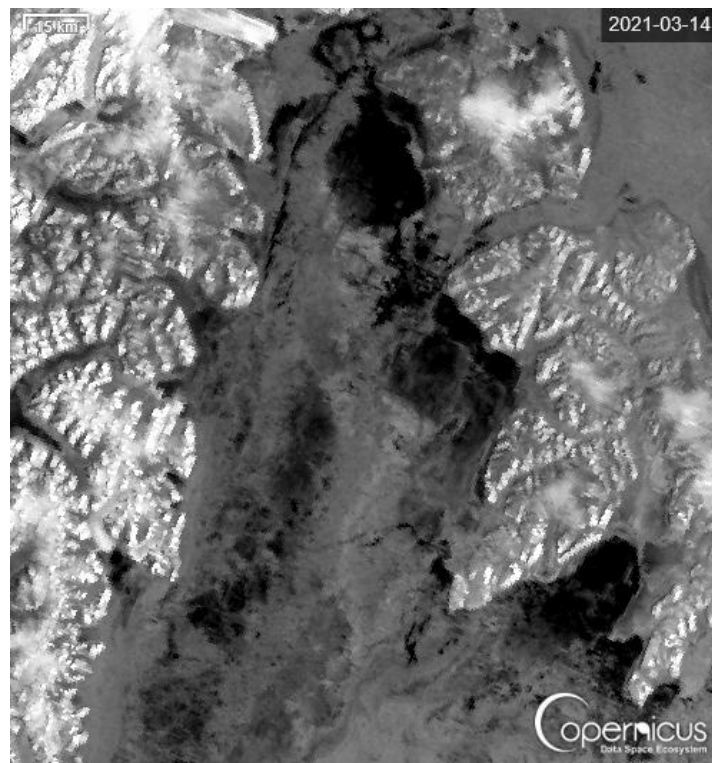
MIZ: sea ice concentration between 15% and 80%



Two poles, two types of sea ice



Sea ice on SAR images



Which information are needed ?

Sea ice thickness (SIT)

Measured by:

- Radar altimeter (Sentinel-3, CryoSat-2, SWOT)
- Lidar altimeter (ICESat-2)

Sea ice mapping

1. The position of the floes and the leads, and other sea-ice type classes
2. Concentration = the proportion of floe vs lead (SIC)

Sea ice drift (SID)

Measured by:

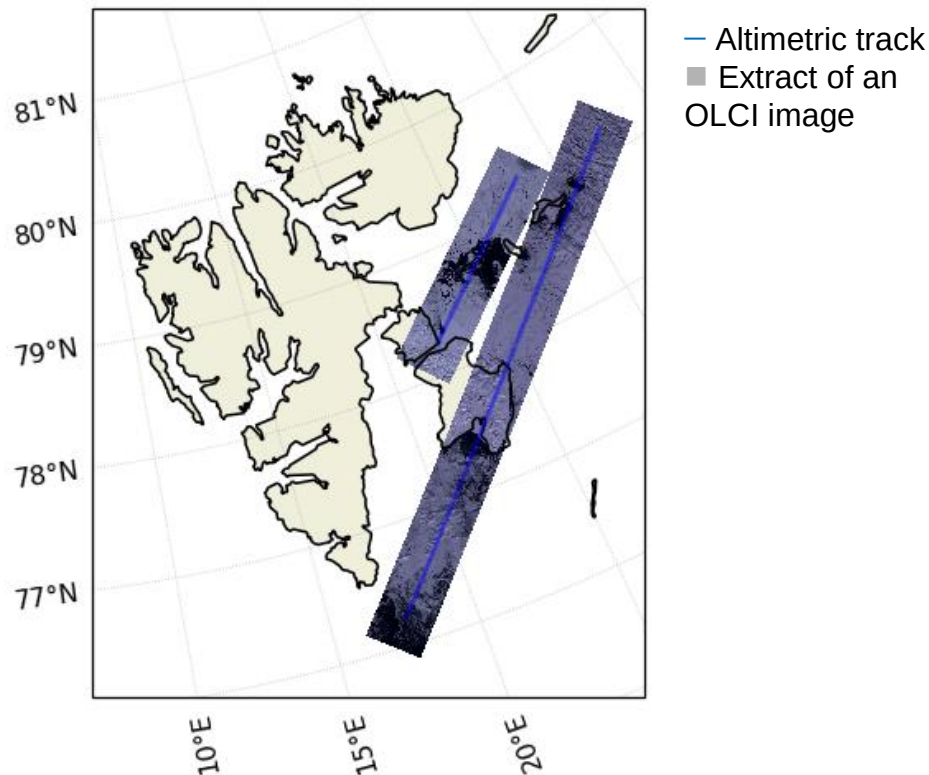
- Radar (Sentinel-1, Radarsat-2)
- Optical imager (Sentinel-2, Sentinel-3, MODIS)
- Passive microwave sensors (AMSR2)

Sentinel-3, a platform for sensor synergy

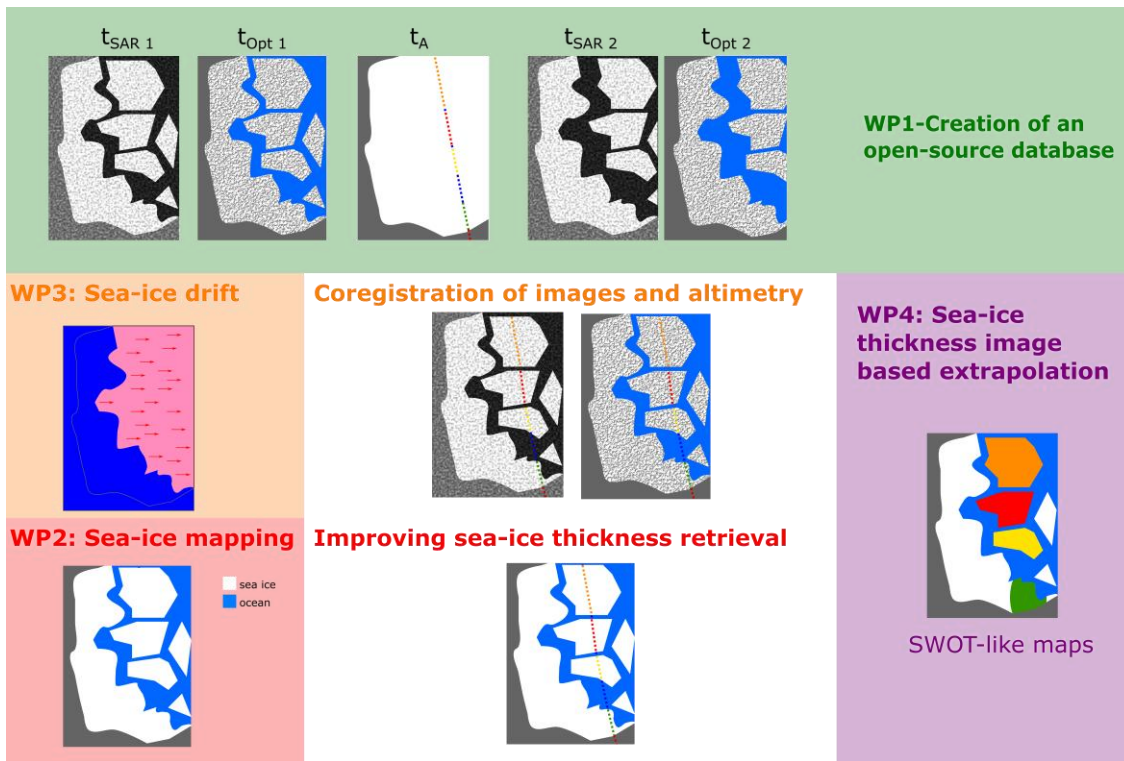


Two sensors:

- OLCI, multispectral imager
300m resolution
- SRAL, radar altimeter
40cm z-resolution, 300m along-track resolution
~1.65km across-track footprint



ANR JCJC SITEMSA: Improving Sea-Ice Thickness (SIT) resolution and density





RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

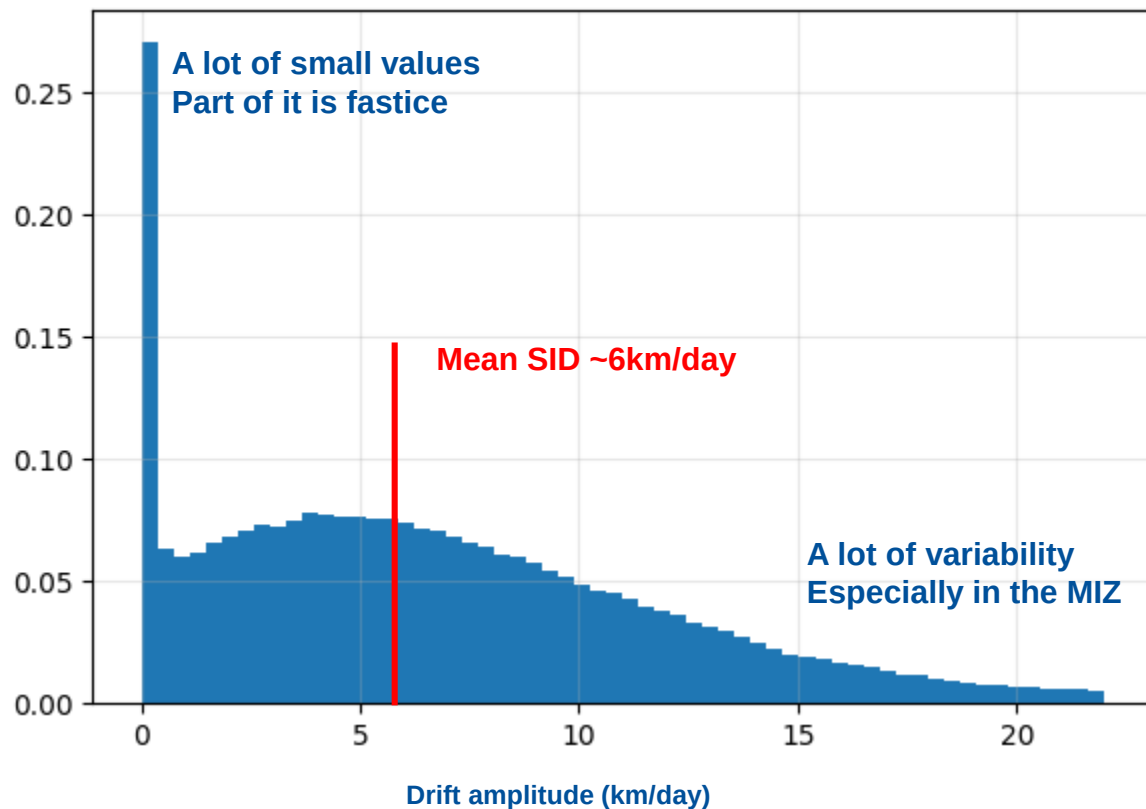
Weakly supervised learning of optical flow deep-learning model adapted to the sea ice drift

Houda Hassini, ONERA, DTIS, SAPIA

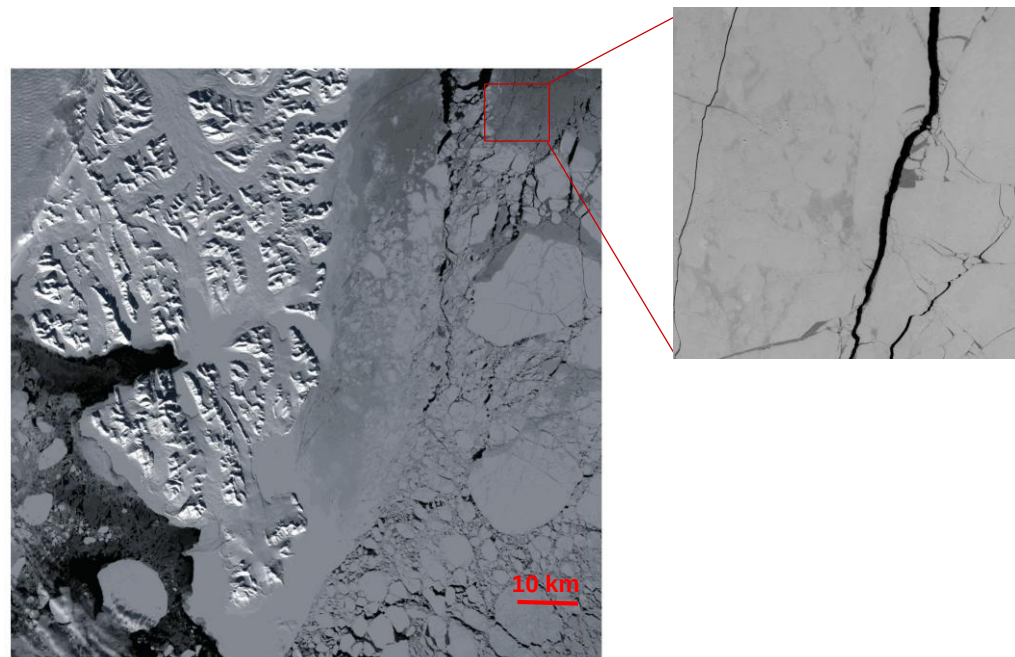
Flora Weissgerber, ONERA, DTIS, SAPIA

Frederic Champagnat, ONERA, DTIS, MIC

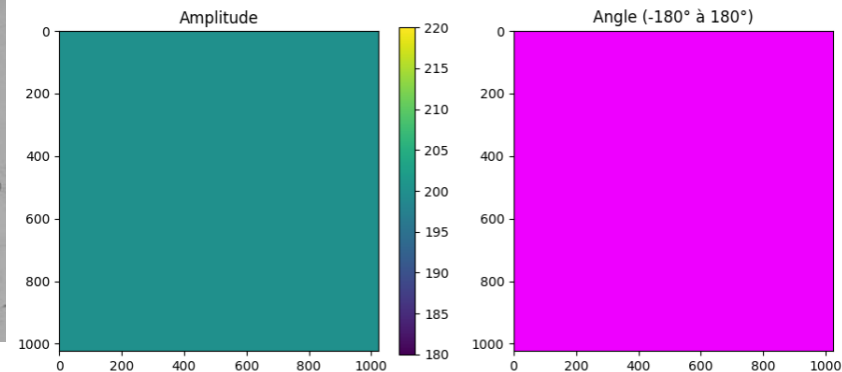
Global Ocean High Resolution SAR Sea Ice Drift for 2025



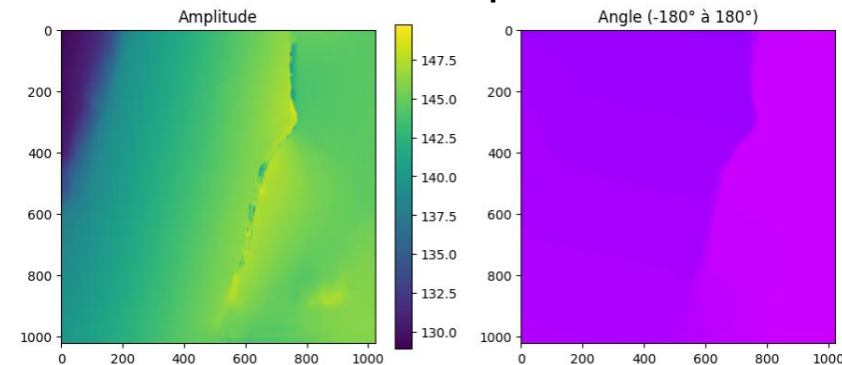
DTU measured drift for 2025



Current drift estimation*

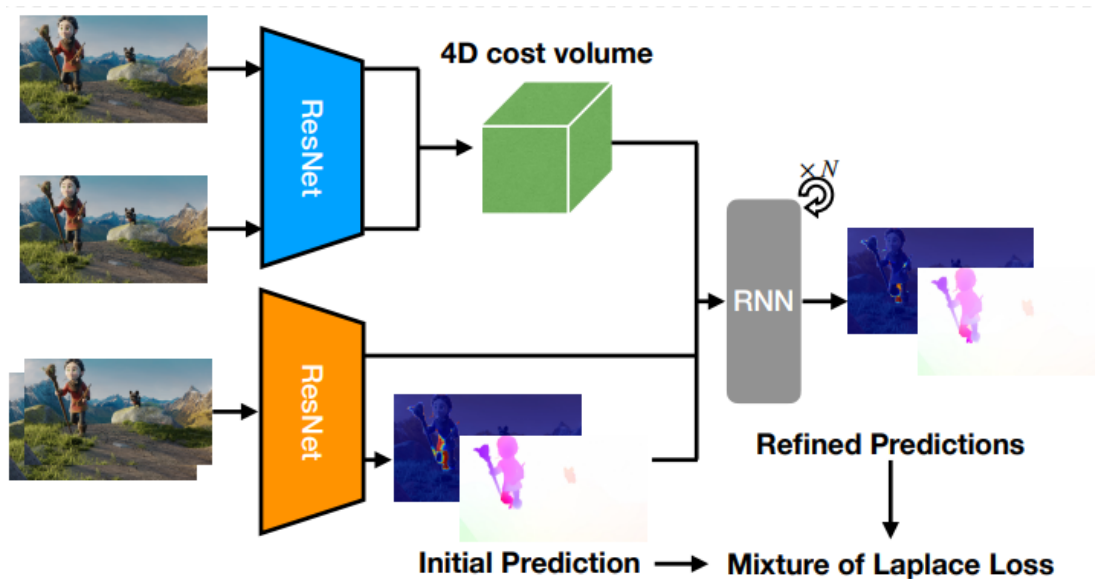


Our output



* European Union-Copernicus Marine Service, “Global Ocean - High Resolution SAR Sea Ice Drift.” 10km sampling

State of the art : SEARAFT as a foundation model



- ResNet : Feature extraction module encodes both images into dense feature maps (fine spatial and contextual details)
- RNN maintains memory across iterations to iteratively refine and improve the optical flow estimates.

Sentinel-2 images

- 700 S2 tiles divided in 1024×1024 pixels patches (10m pixel spacing)
- Red band (B04)

Case 1: Fracture

Image 1

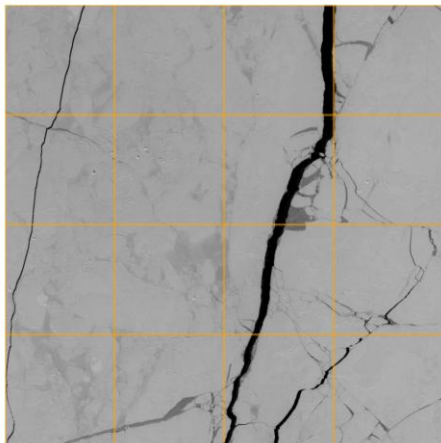
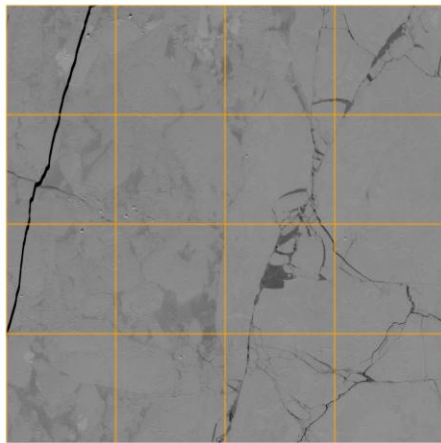
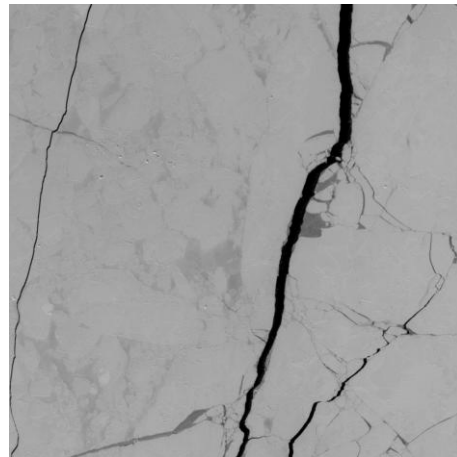


Image 2



Gif



Sentinel-2 images

- 1024 x 1024 pixels patches (10m pixel spacing)
- Red band (B04)

Case 2: Translation of homogeneous images with a change in illumination

Image 1

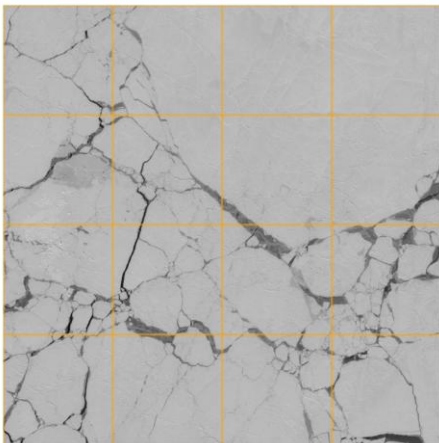
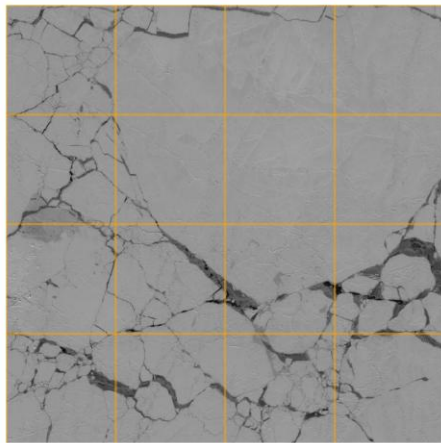
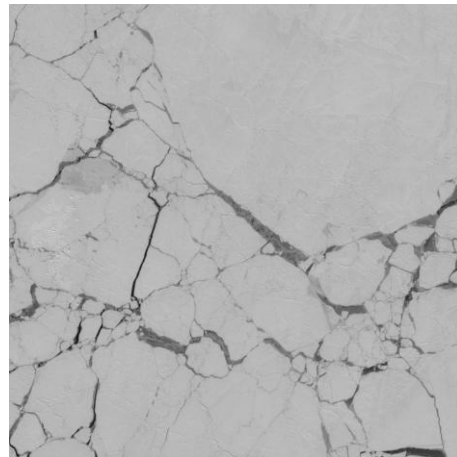


Image 2



Gif



Sentinel-2 images

- 1024 x 1024 pixels patches (10m pixel spacing)
- Red band (B04)

Case 3: Individual floes

Image 1

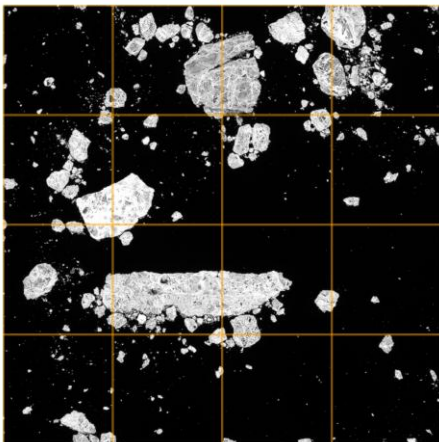
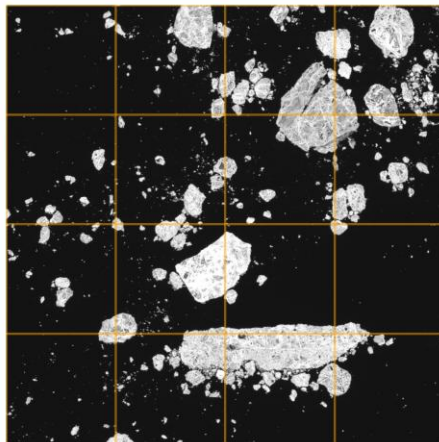
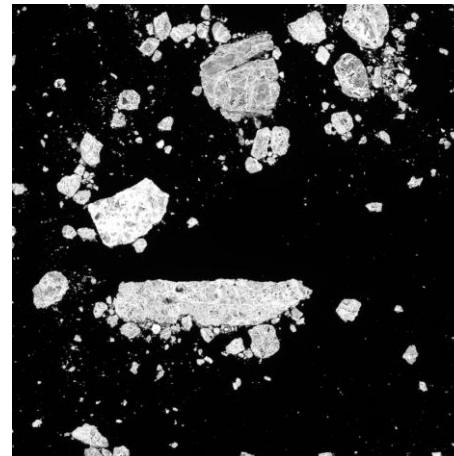


Image 2



Gif



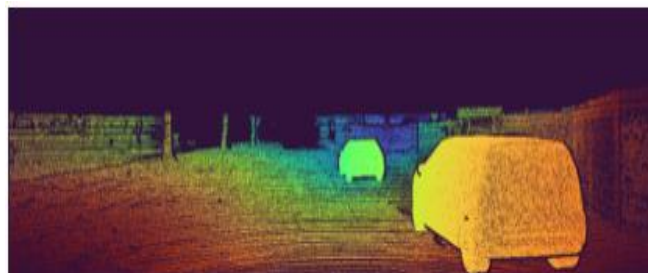
SEARAF application fields

- Several dataset (videos games, simulation and autonomous driving)
- Images with rich texture, characterized by a high density of edges and details
- Homogeneous, relatively continuous motion

Images



Optical Flow map



SEA-RAFT on sea-ice images – case 1 (fracture)

Baseline

Image 2

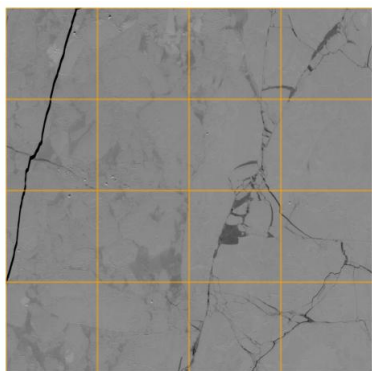
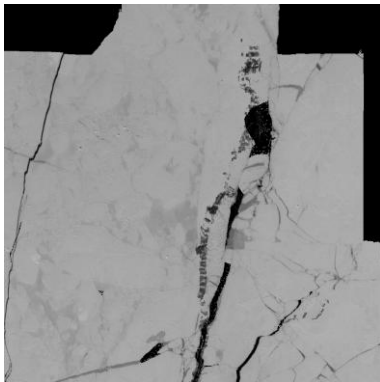
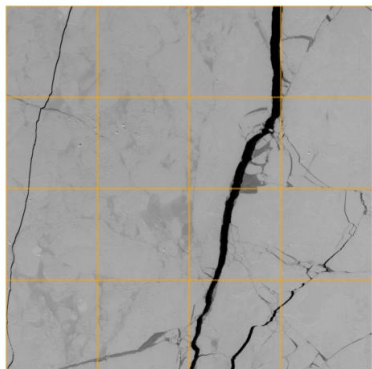
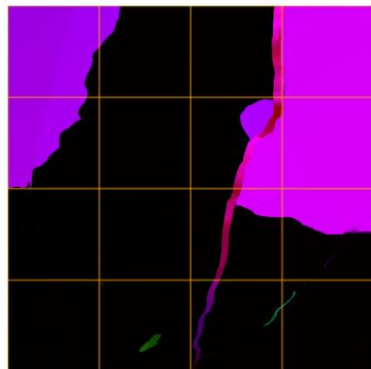


Image 1



Drift orientation and
relative amplitude



SEA-RAFT on sea-ice images – case 2 (translation)

Baseline

Image 2

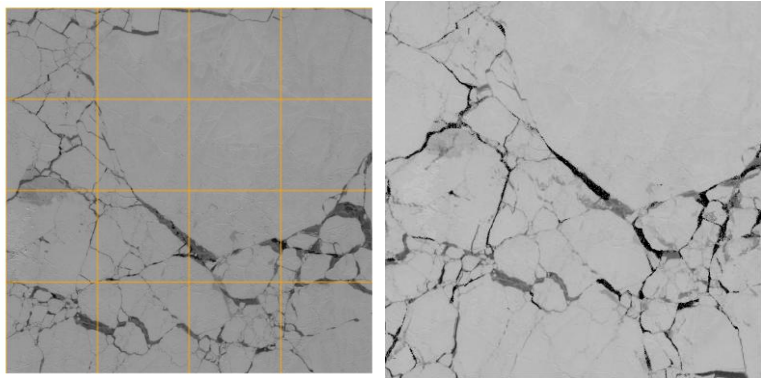
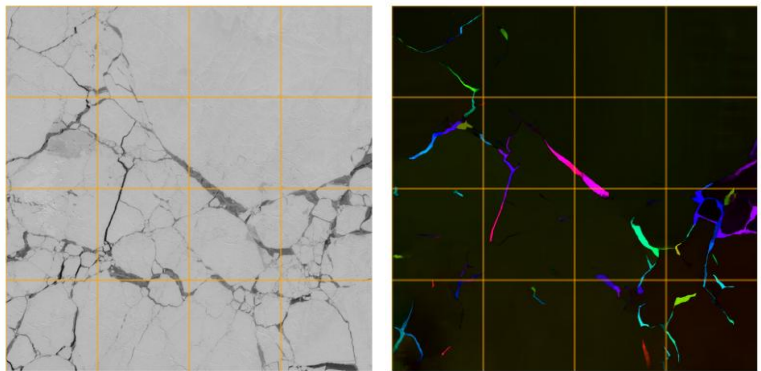


Image 1



Drift orientation and
relative amplitude



SEA-RAFT on sea-ice images – case 3 (floes)

Baseline

Image 2

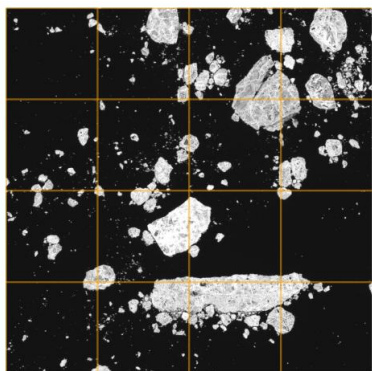
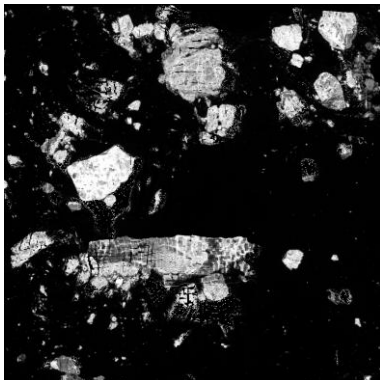
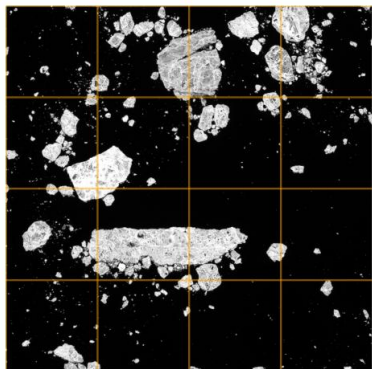
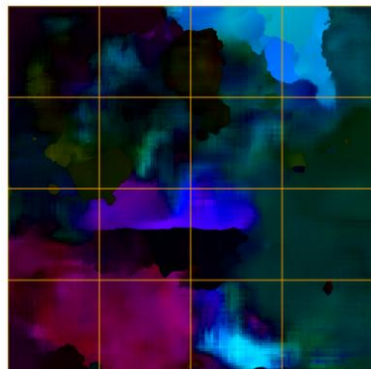


Image 1

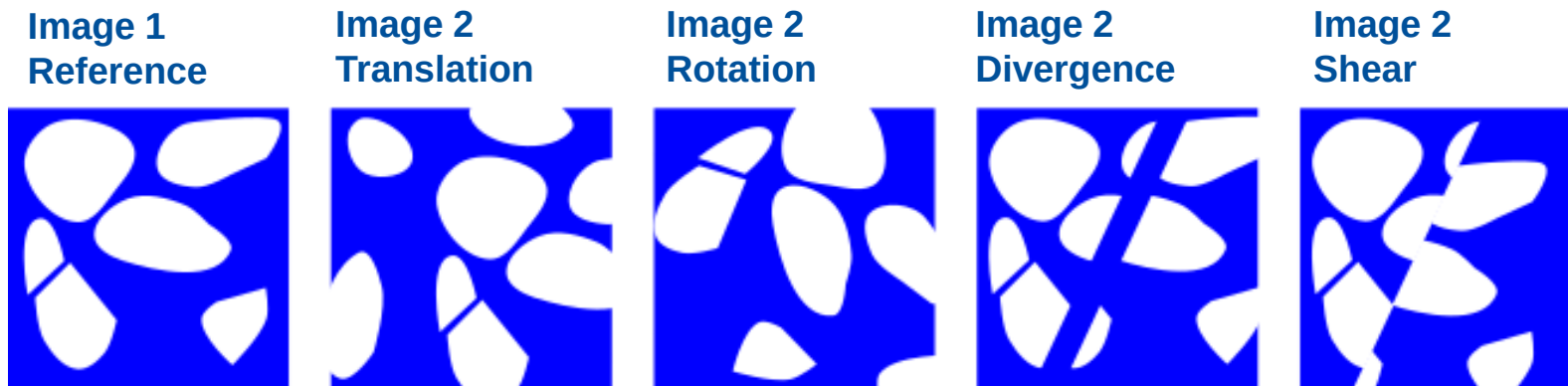


Drift orientation and
relative amplitude



Finu-tuning of a sea-ice dataset

Hypothesis: Instead of replicating real drift, we break it into specific motion component



Motion amplitude: between 0 and 500 pixels + between 501 and 600 pixels for test

4 motion types x 5 motion amplitudes = 20 cases. For each case :

Train: **2000** images

Val: 500 images

Test: 1000 images

SEA-RAFT on sea-ice images – case 1 (fracture)

Baseline

Scene finetuning

Image 2

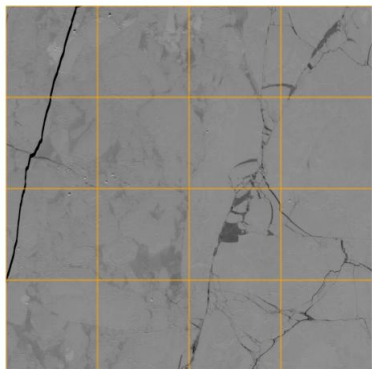
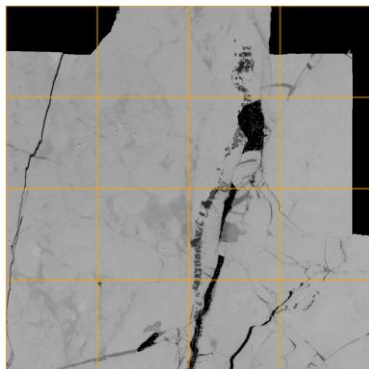
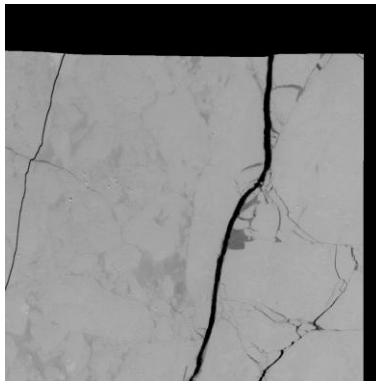
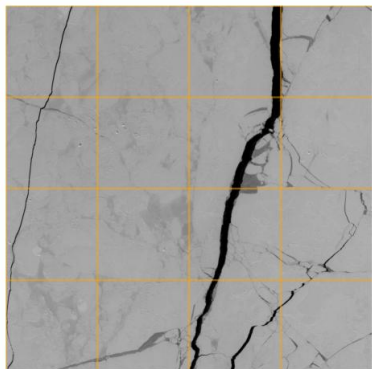
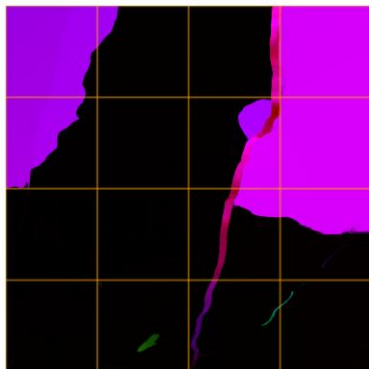
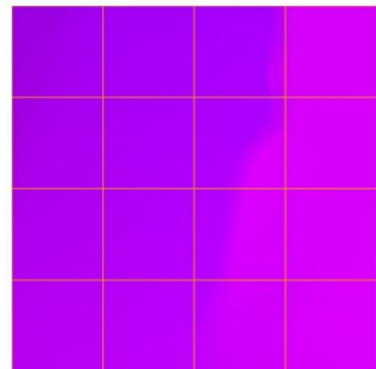


Image 1



Drift orientation and relative amplitude

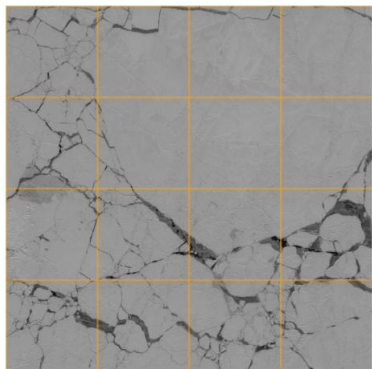
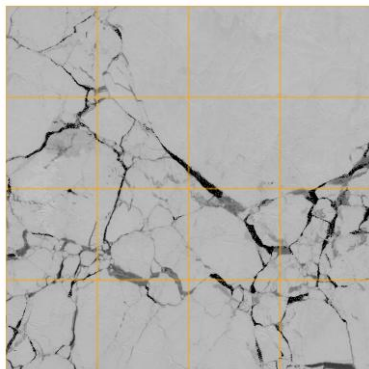
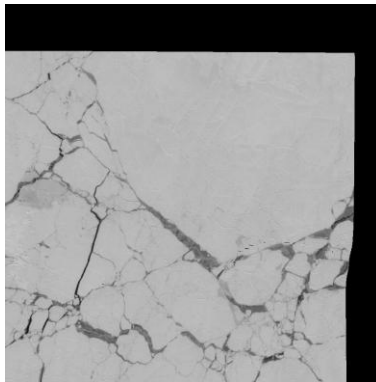


SEA-RAFT on sea-ice images – case 2 (translation)

Baseline

Scene finetuning

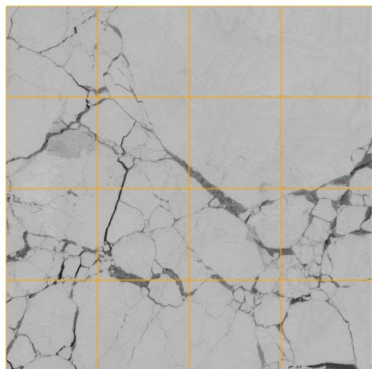
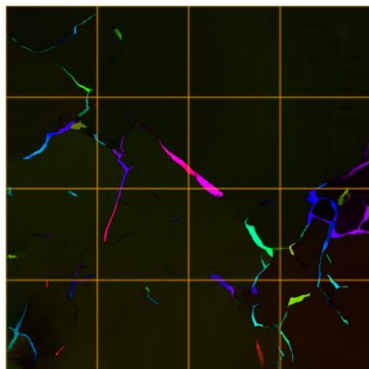
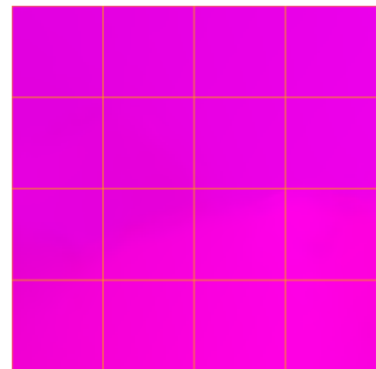
Image 2



Drift orientation and
relative amplitude



Image 1



SEA-RAFT on sea-ice images – case 3 (floes)

Baseline

Scene finetuning

Image 2

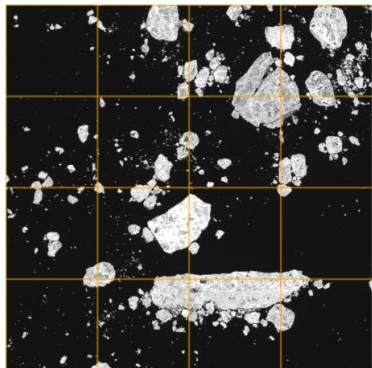
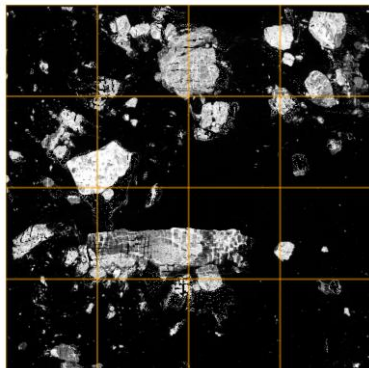
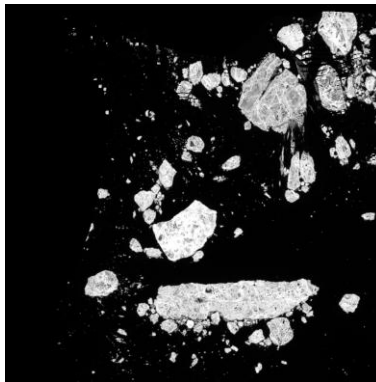
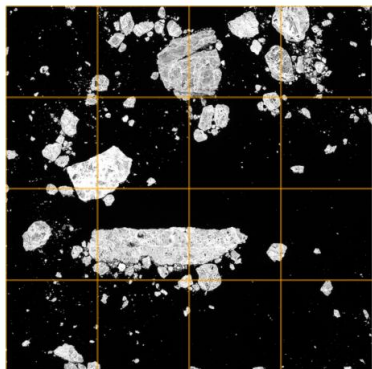
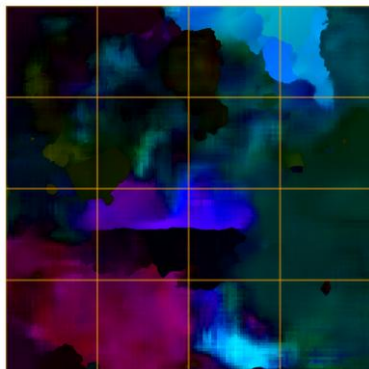
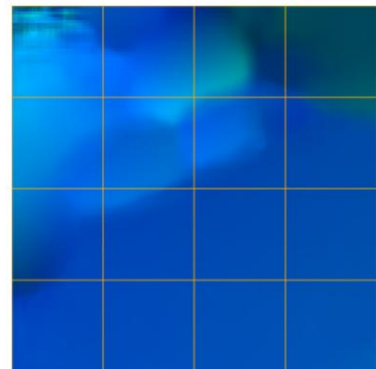


Image 1



Drift orientation and
relative amplitude



Finu-tuning of a sea-ice dataset

Hypothesis: Taking into account the piecewise nature of sea-ice drift will improve the estimation
Only 1 floe of the image is moved

Image 1
Reference



Image 2
Translation



Image 2
Rotation



Image 2
Divergence



Image 2
Shear



Motion amplitude: between 0 and 500 pixels + between 501 and 600 pixels for test

2 simulation types x 4 motion types x 5 motion amplitudes = 40 cases. For each case:

Train: **1000** images

Val: 500 images

Test: 1000 images

SEA-RAFT on sea-ice images – case 1 (fracture)

Baseline

Scene finetuning

Scene+floe finetuning

Image 2

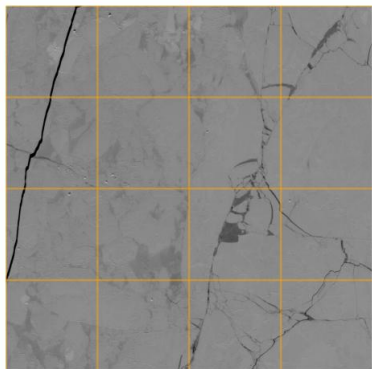
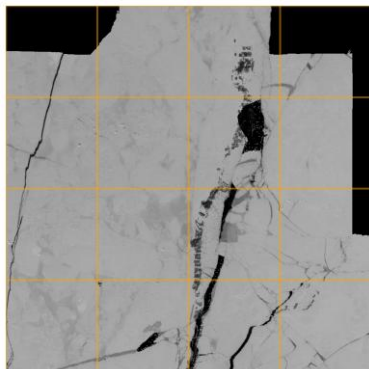
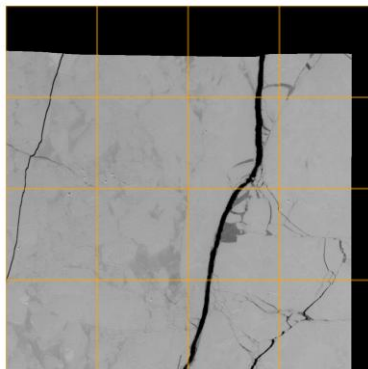
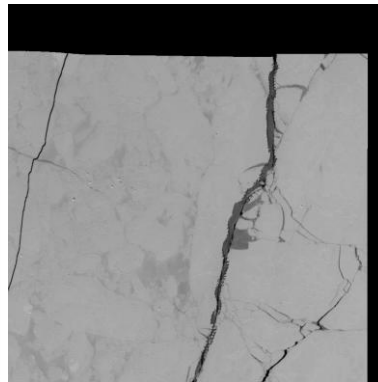
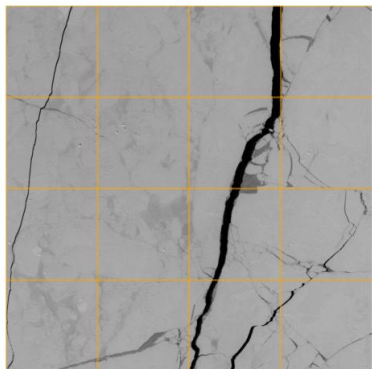
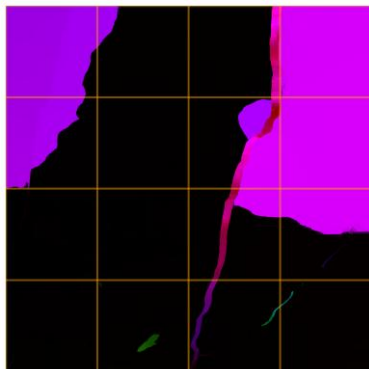
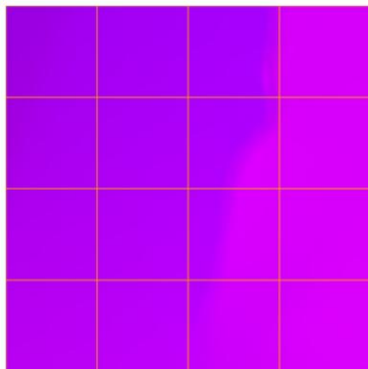
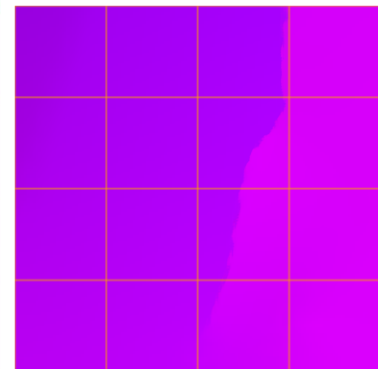


Image 1



Drift orientation and relative amplitude



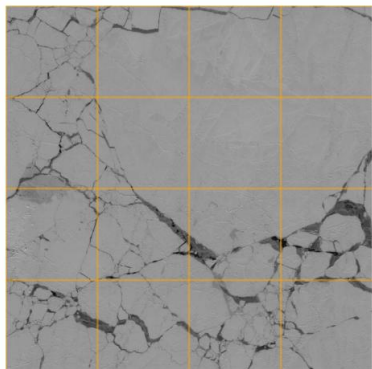
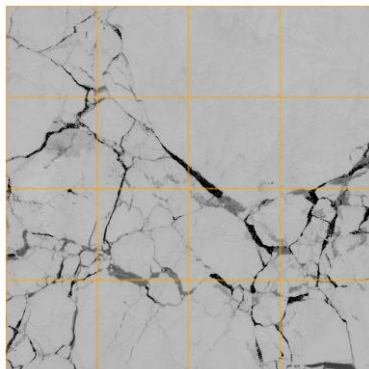
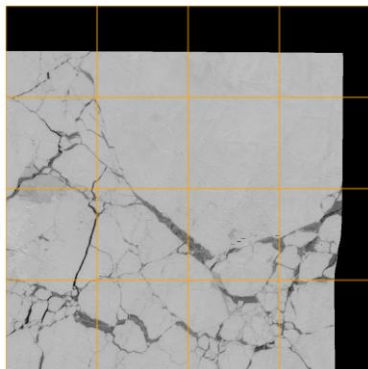
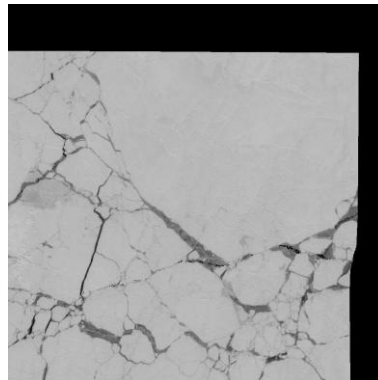
SEA-RAFT on sea-ice images – case 2 (translation)

Baseline

Scene finetuning

Scene+floe finetuning

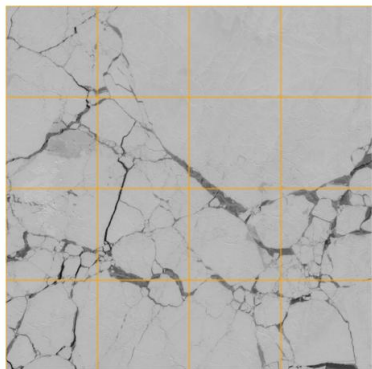
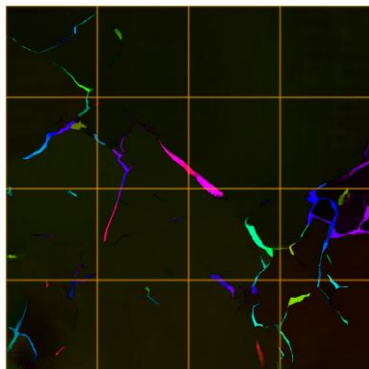
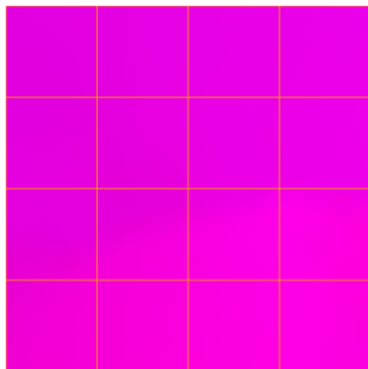
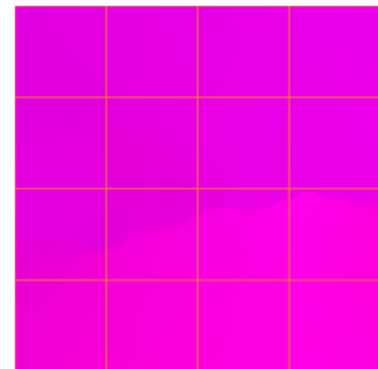
Image 2



Drift orientation and
relative amplitude



Image 1



SEA-RAFT on sea-ice images – case 3 (floes)

Baseline

Scene finetuning

Scene+floe finetuning

Image 2

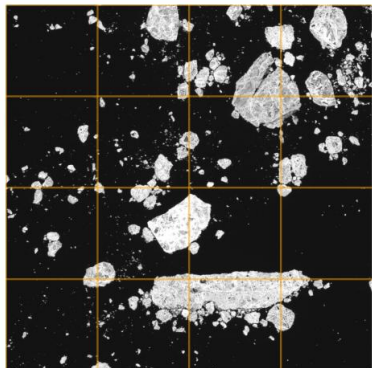
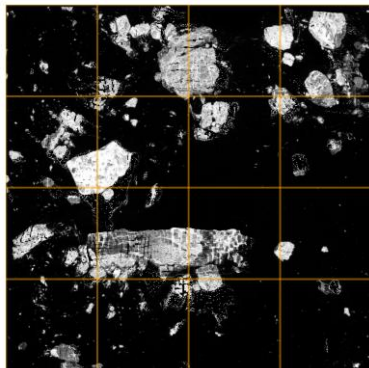
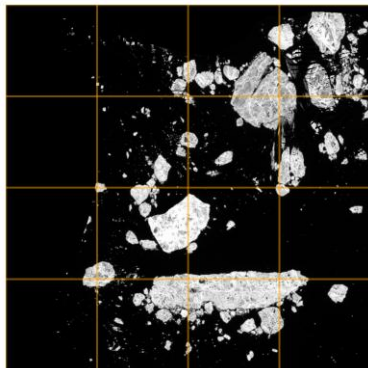
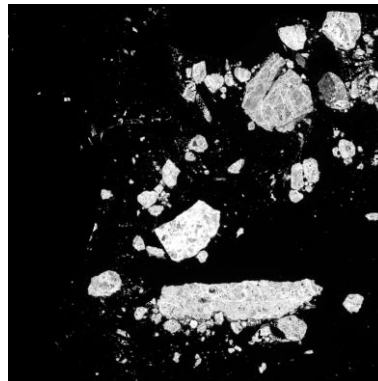
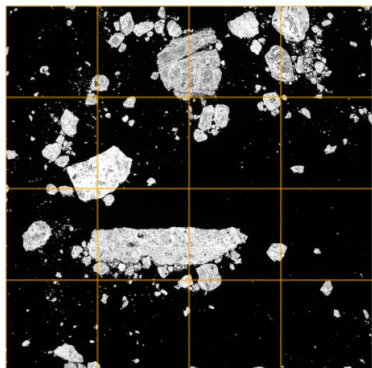
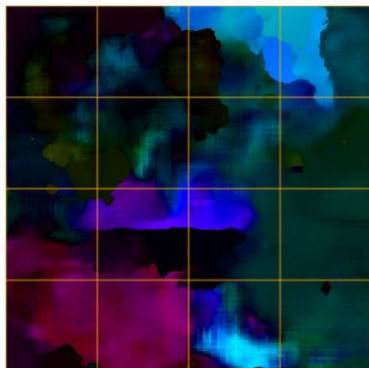
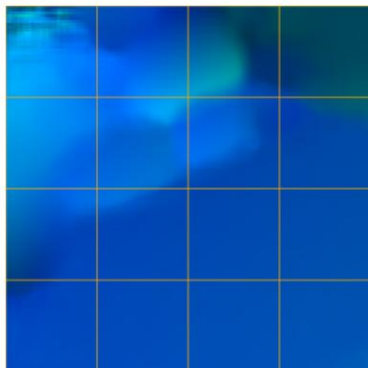
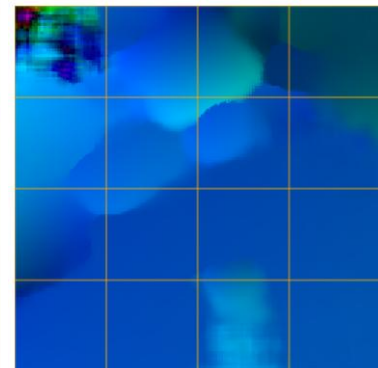


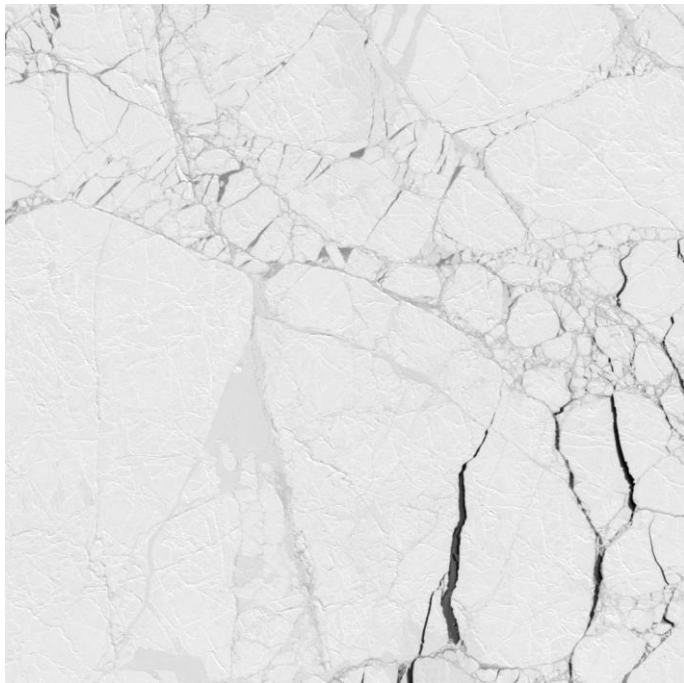
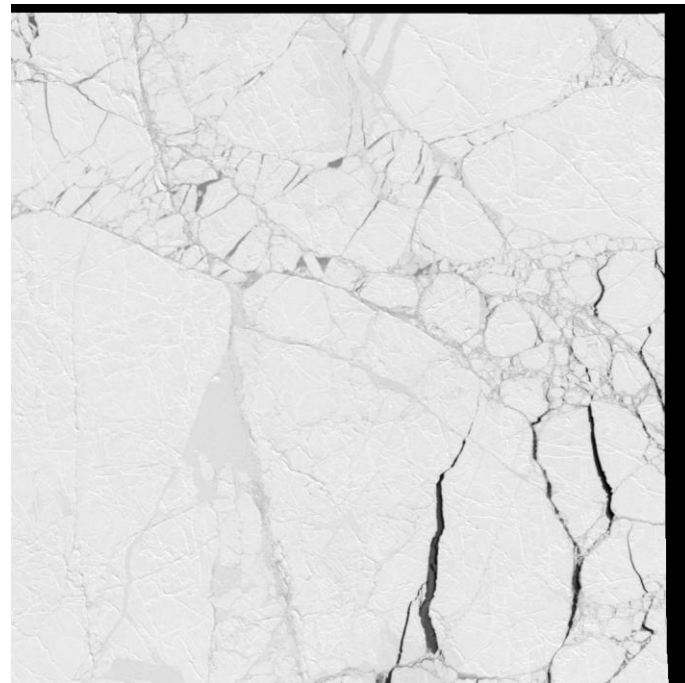
Image 1



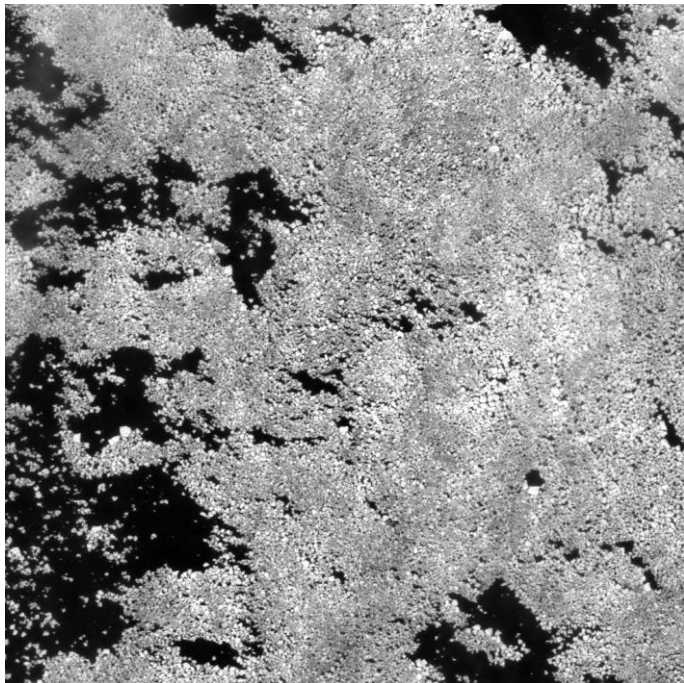
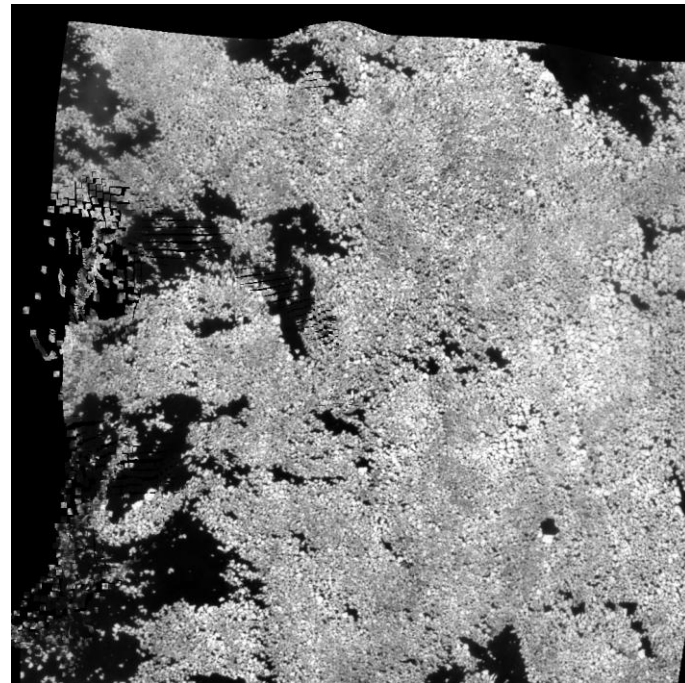
Drift orientation and relative amplitude



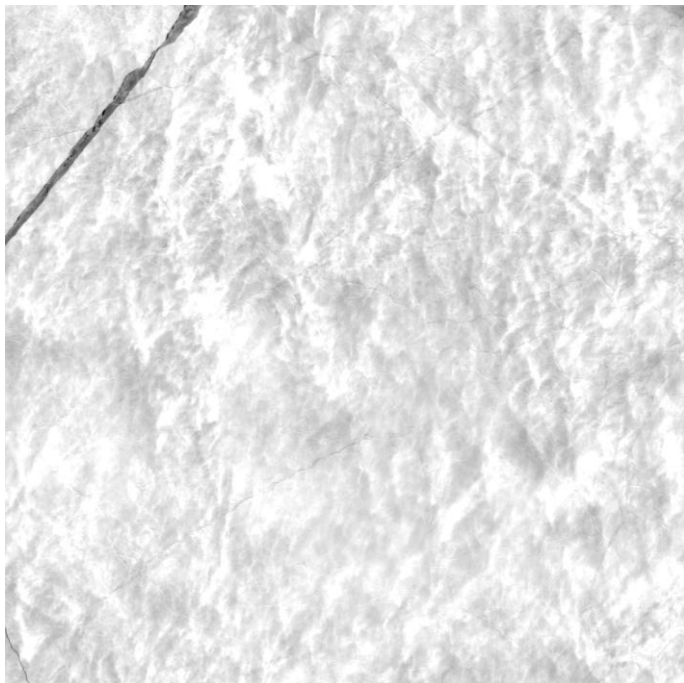
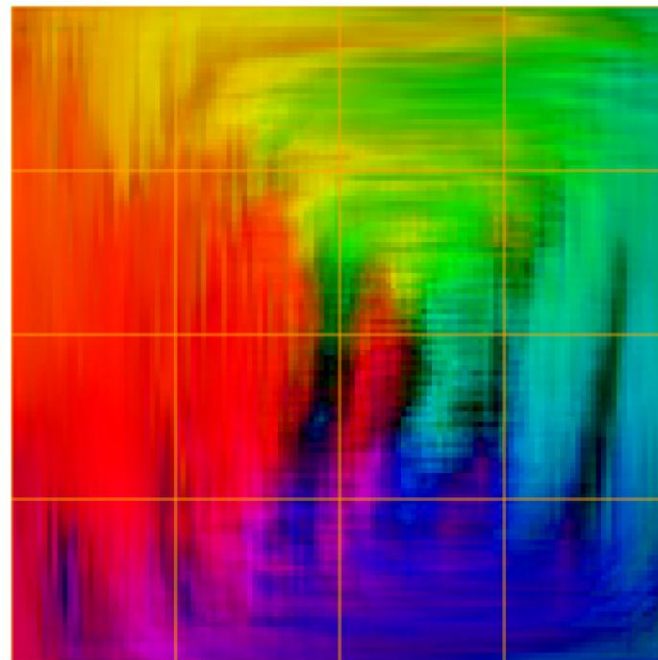
Impact of the clouds – Thin cloud



Impact of the clouds – Thin cloud



Impact of the clouds – Thick cloud



Continuity between the subtiles

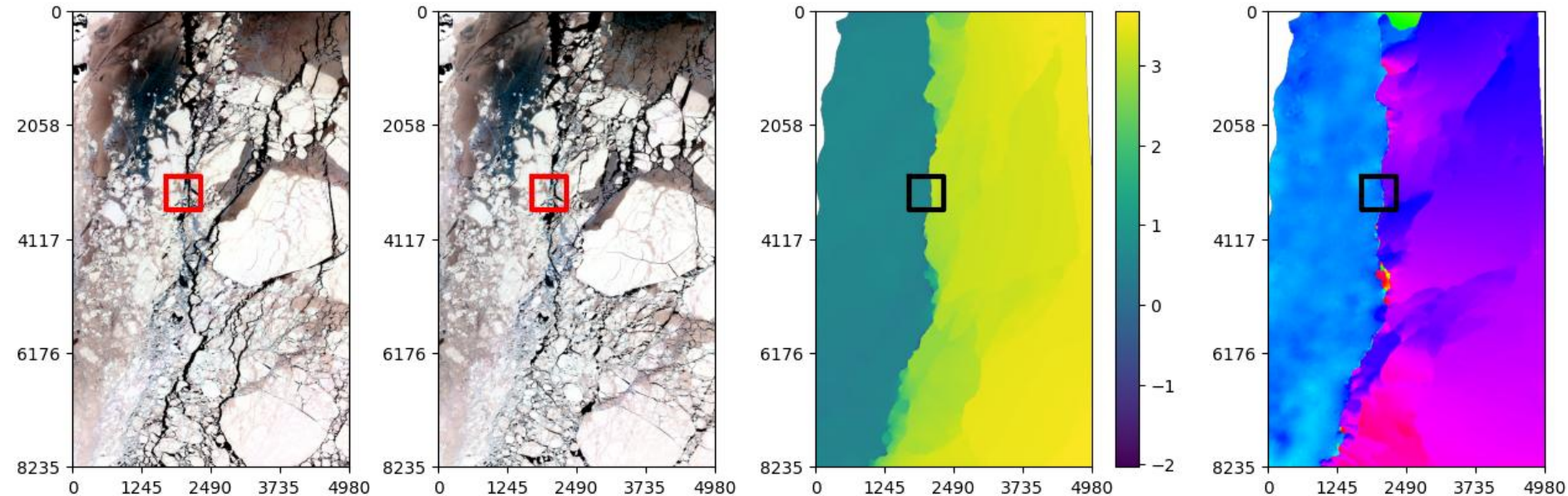
Tile 33XWF

2024/04/06

2024/04/07

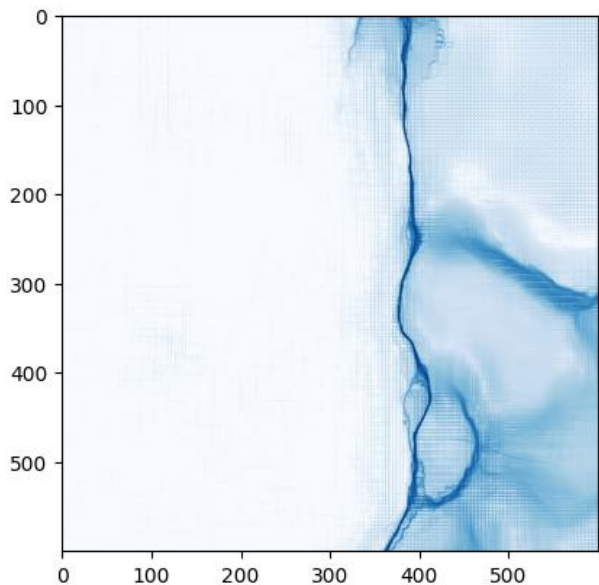
amplitude

angle

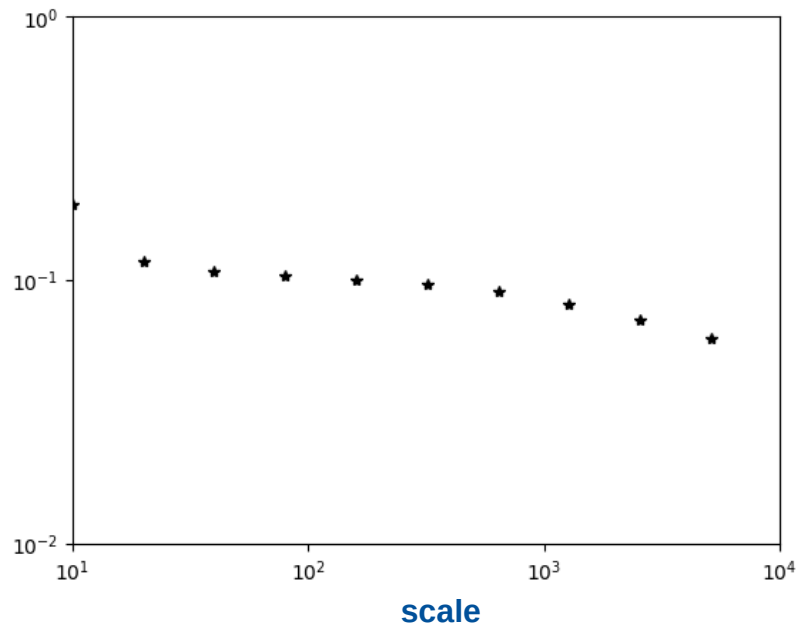


Derivative with scale

Total derivative



Mean of the derivative



On going work

Pan-Arctic validation

- Comparison with the existing DTU product

Finalizing publication

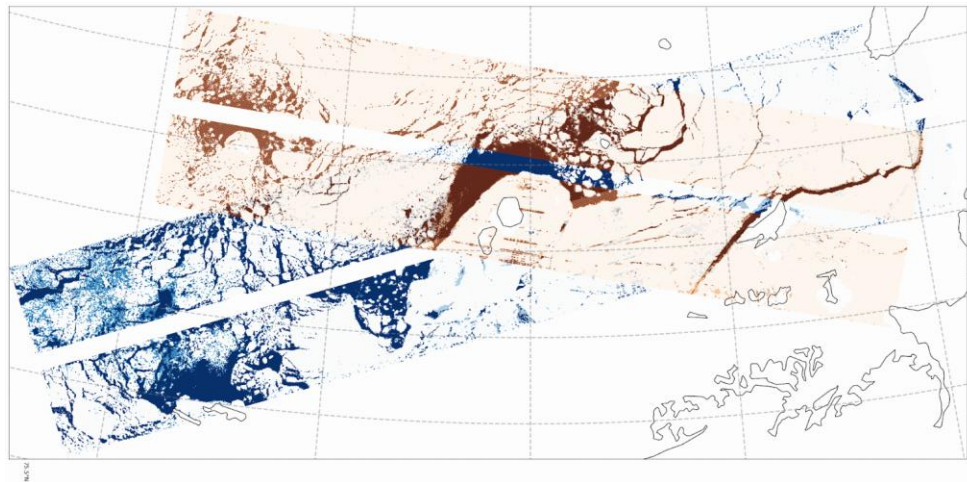


Future work

Transferring to Sentinel-1

Transferring to SWOT

Houda Hassini's future CNES postdoc



Credit Sara Fleury, LEGOS



RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

A floe-by-floe clustering of SIFT features based on the SAM foundation model adapted the Marginal Ice Zone drift

Laura Orgambide, ONERA, DTIS, SAPIA and CNES

Flora Weissgerber, ONERA, DTIS, SAPIA

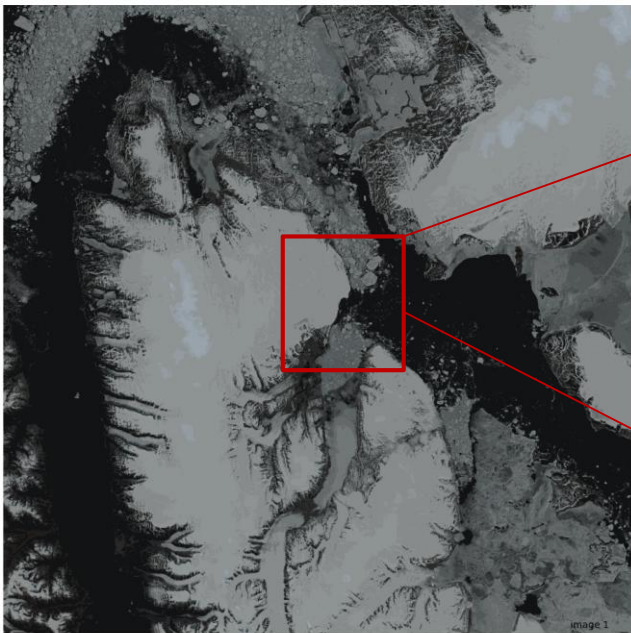
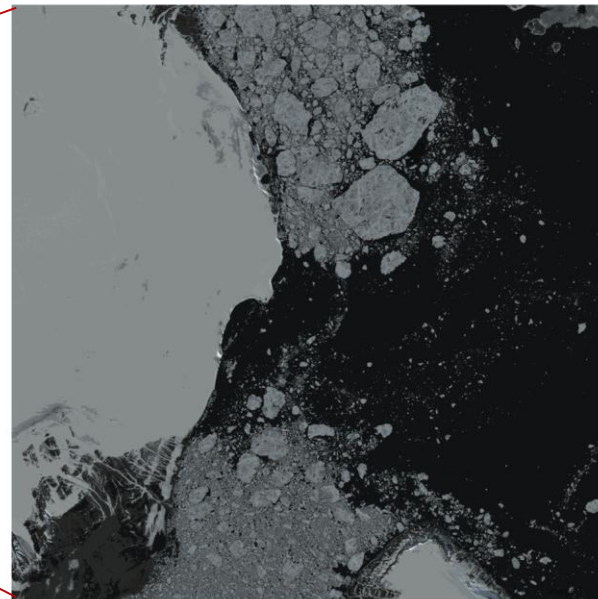
Frederic Champagnat, ONERA, DTIS, MIC

Sara Fleury, LEGOS

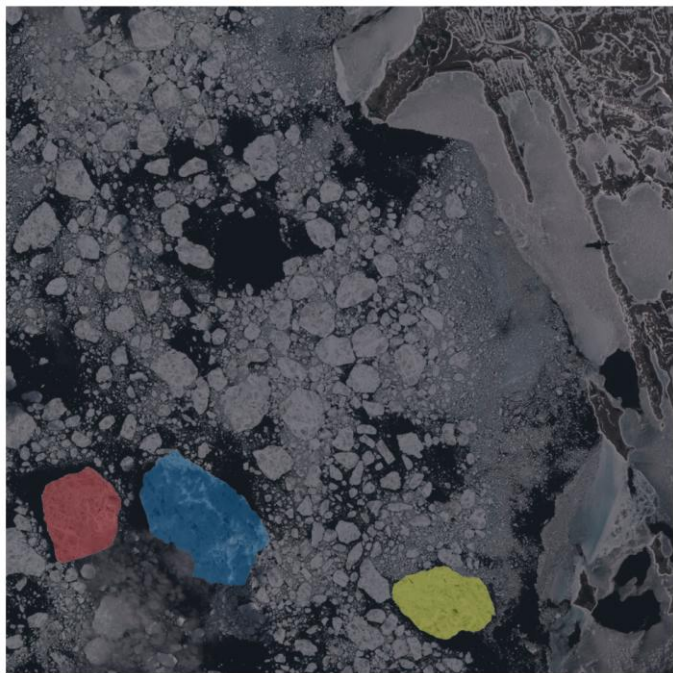
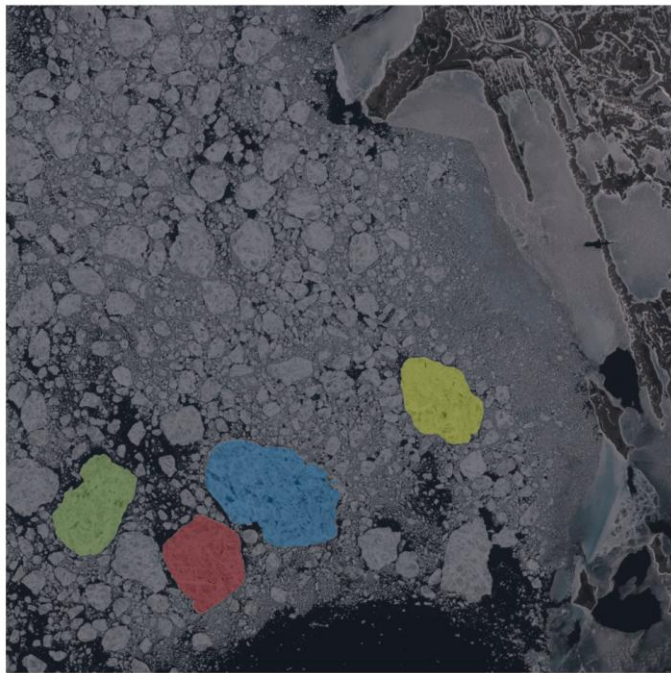
Carlos Yanez, CNES

MIZ in the North of Svalbard

Case 1

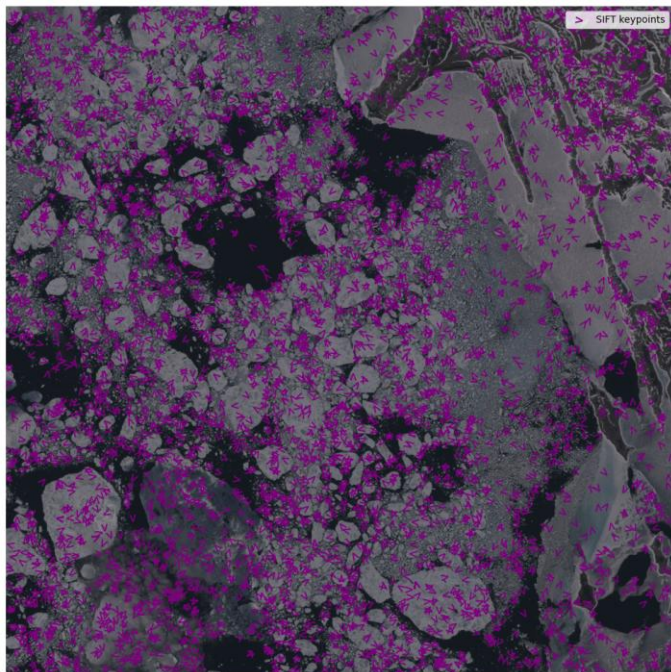
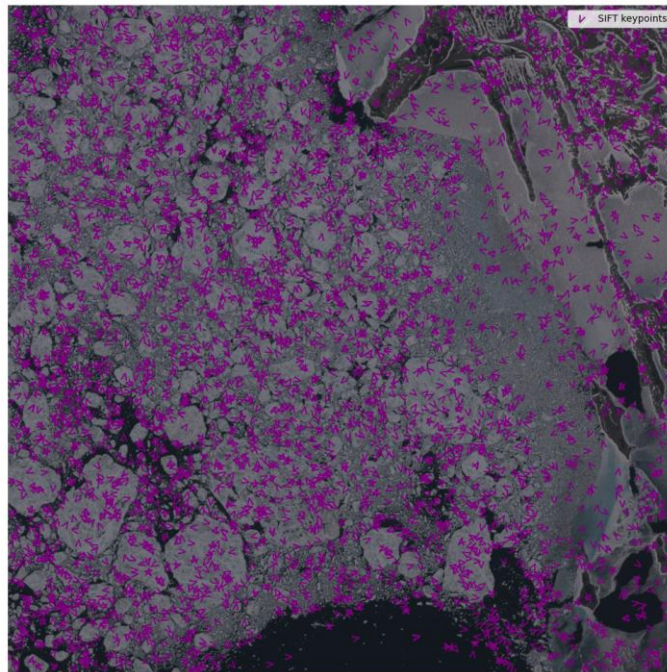


MIZ: individual floe with a complex drift (case 2)



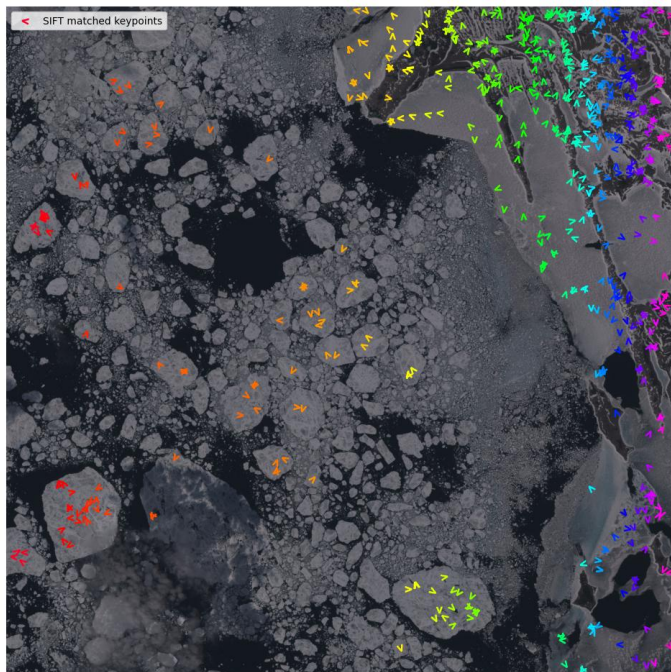
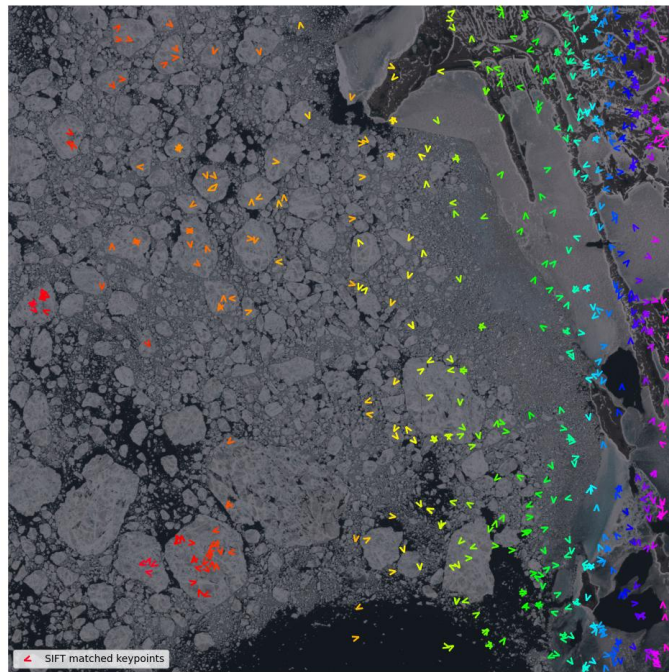
- Floes exhibiting different translation and rotation

SIFT feature extraction



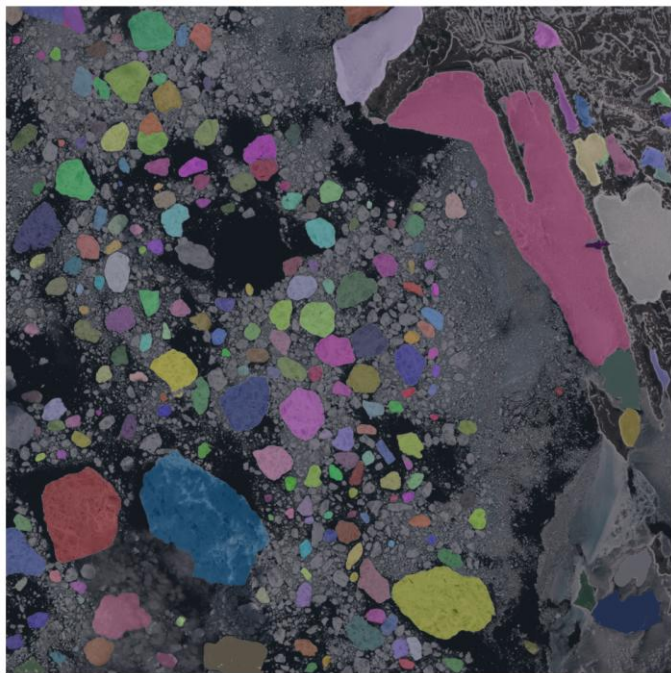
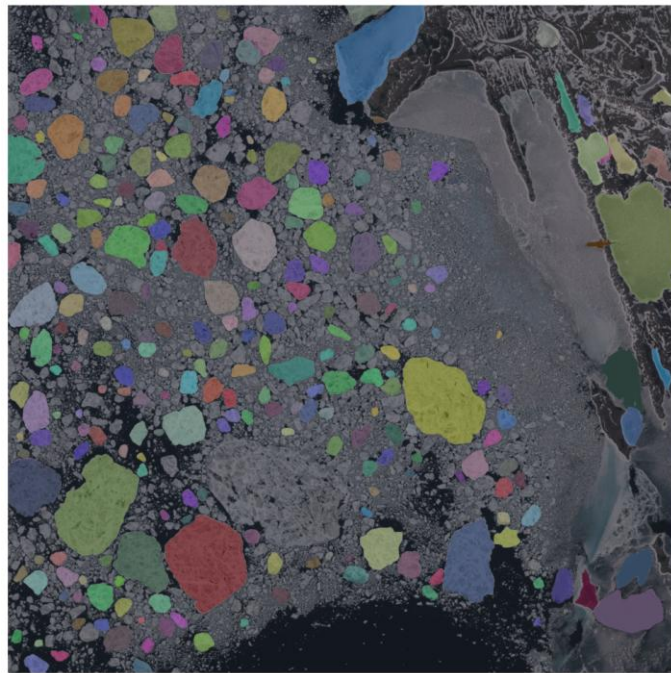
- A large number of features
- Selected in the inner part of the floes

Brut-force feature matching



- Brut-force keypoint matching exhibits errors
- The drift could not be summarized as one vector

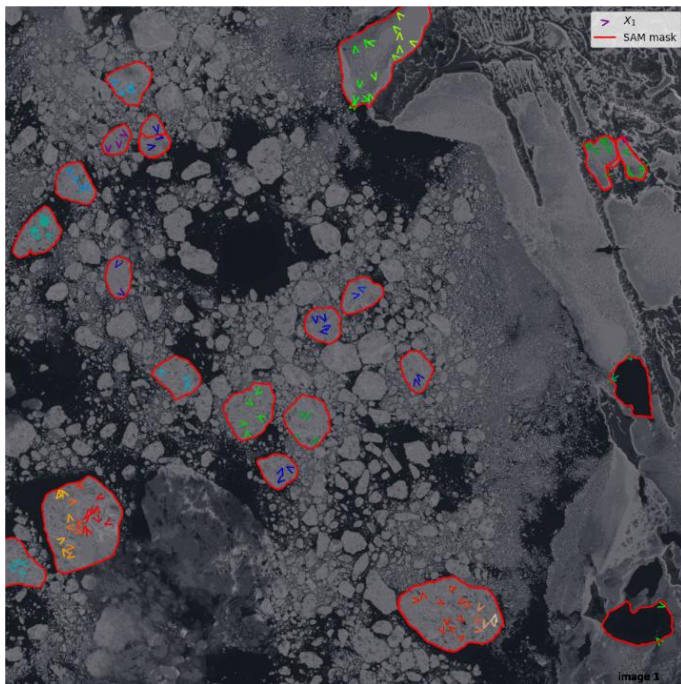
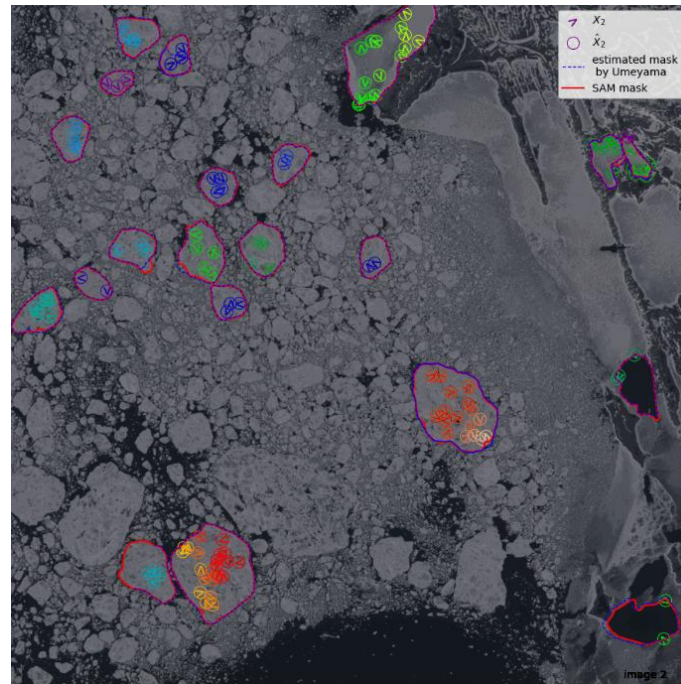
Keypoint clusteting by segmenting individual floes



- SAM [Kirillov2023] algorithm is detecting some regions on land
- Some floes are missed

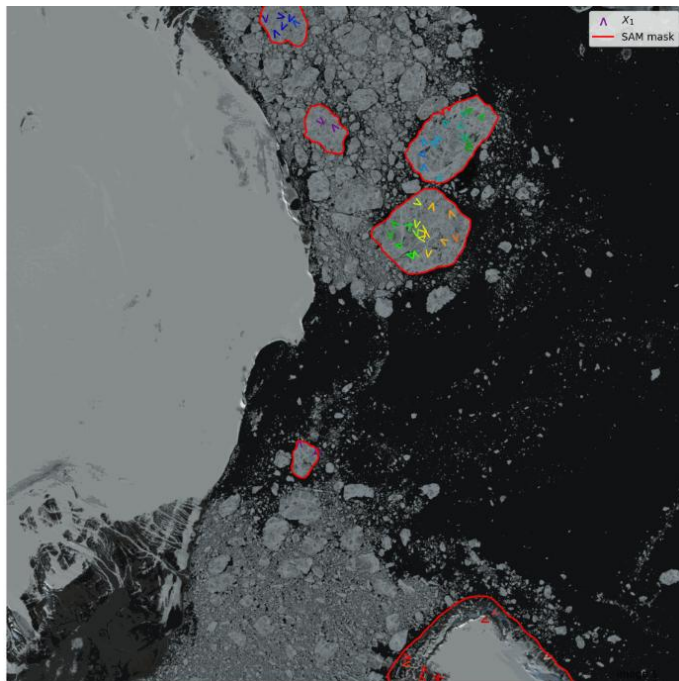
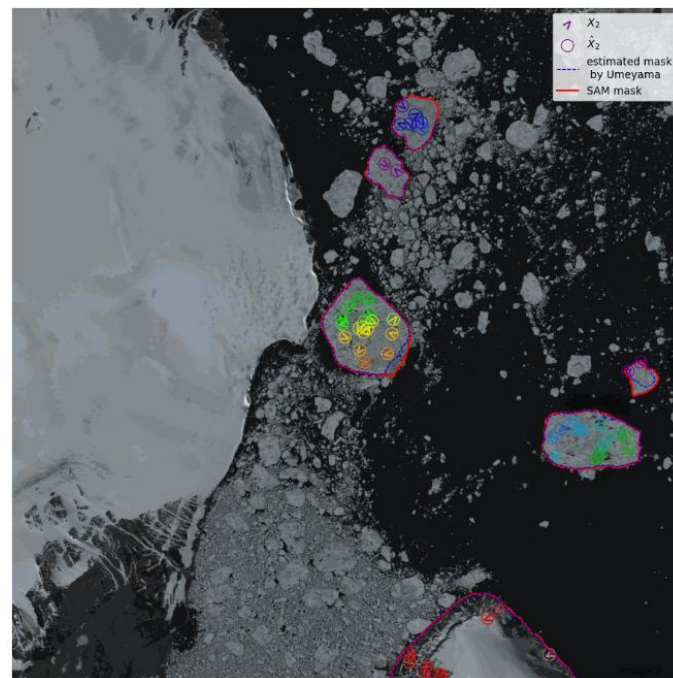
Floe-by-floe feature matching + Umeyama

23 masks
matched:
17 floes
6 on land



- Umeyama method:
 - estimates translation and rotation from a set of matched keypoints
 - Enables projecting the keypoint from image 1 to image 2 and measuring residus

MIZ: individual floe with a complex drift (case 1)



- Floes exhibiting different translation and rotation



RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

Weakly supervised sea-ice leads semantic segmentation of SAR images

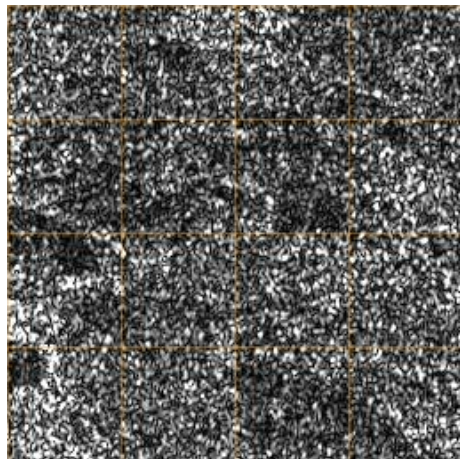
Michelangelo Mussini, ONERA, DTIS, SAPIA and Telecom Paris

Flora Weissgerber, ONERA, DTIS, SAPIA

Florence Tupin, Telecom Paris

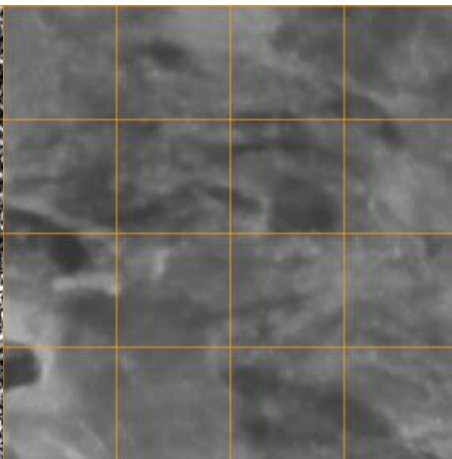
Creation of a SAR/optic semantic segmentation dataset

SAR image

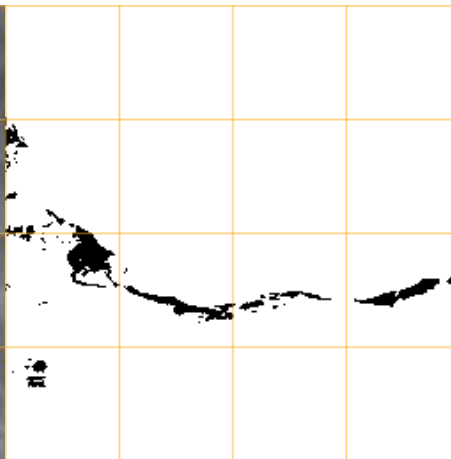


S1 acquired on 13/03/2020 at 06:07:44

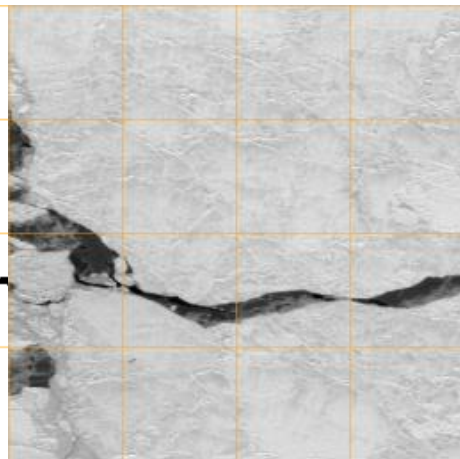
SAR image
Denoised with MERLIN



Floe/lead
classification



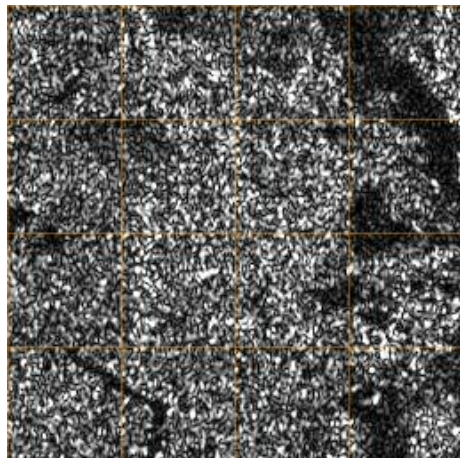
Optical image projected
on the SAR grid



S2 acquired on 13/03/2020 at 12:17:59

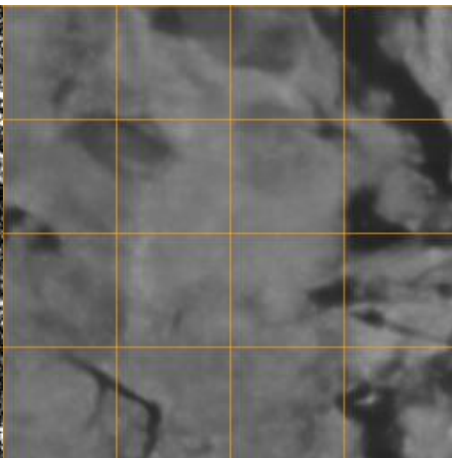
Creation of a SAR/optic semantic segmentation dataset

SAR image

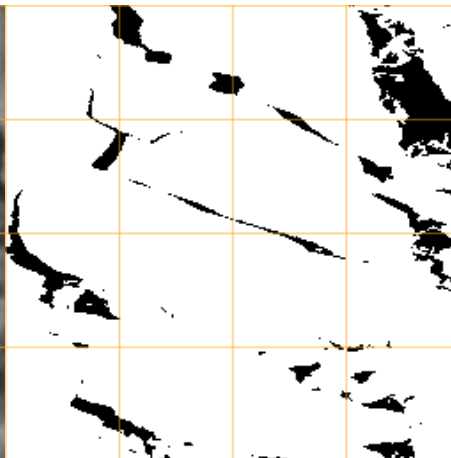


S1 acquired on 13/03/2020 at 06:07:44

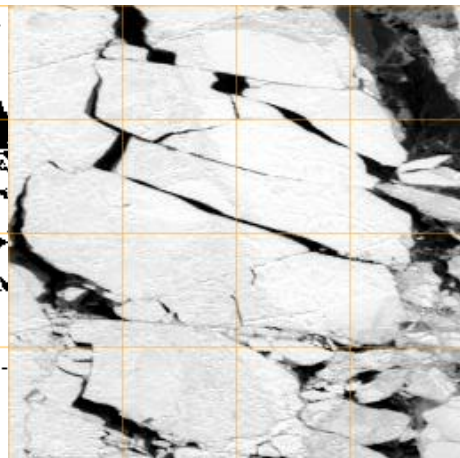
SAR image
Denoised with MERLIN



Floe/lead
classification



Optical image projected
on the SAR grid



S2 acquired on 13/03/2020 at 12:17:59



RÉPUBLIQUE
FRANÇAISE

*Liberté
Égalité
Fraternité*

ONERA

THE FRENCH AEROSPACE LAB

SAR and optical images time series of various resolution for seasonal snow monitoring

Swann Briand, ONERA and LS2N and LIPADE

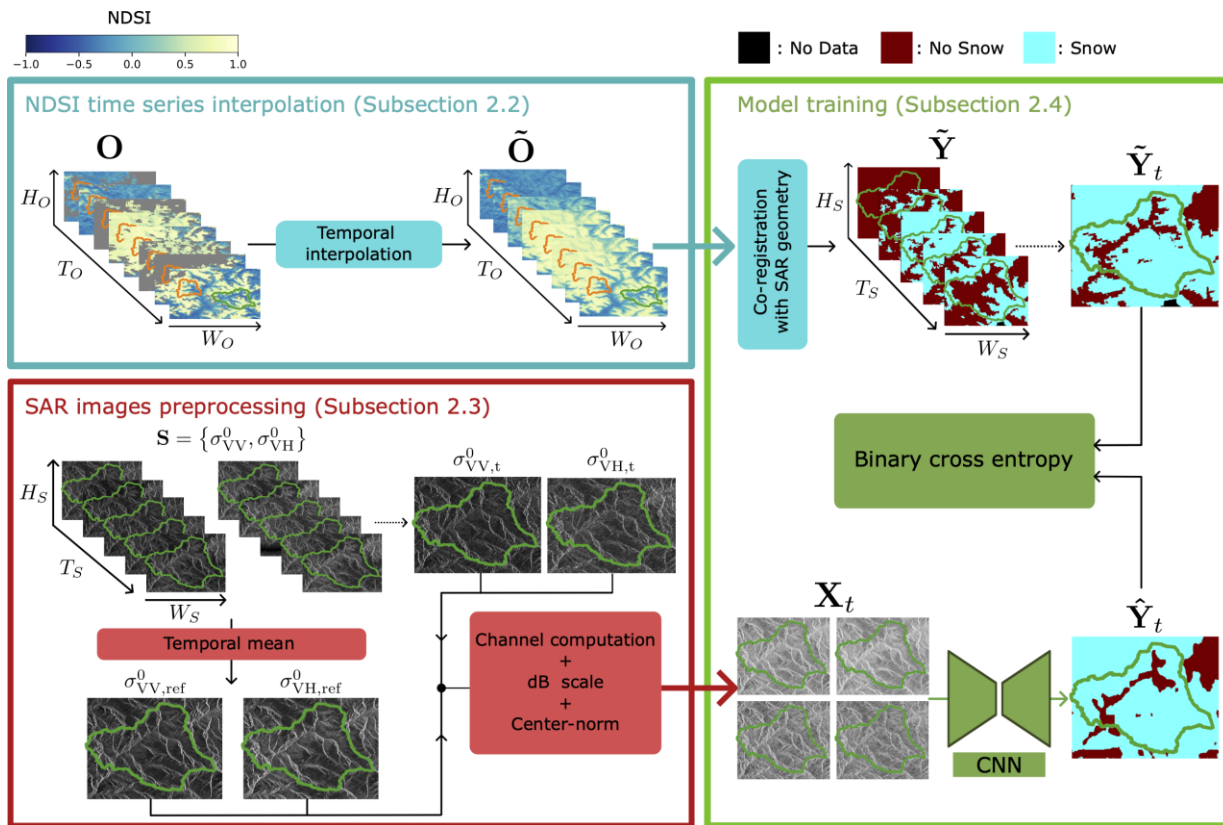
Flora Weissgerber ONERA, DTIS, SAPIA

Sylvain Lobry, LIPADE

Jérôme Idier, LS2N

Can NDSI interpolation and regularization improve snow detection ?

Only 40% of the pixels had a label



Weakly supervised deep-learning for the remote sensing of seasonal snow and sea ice

Flora Weissgerber ONERA, DTIS, SAPIA

Swann Briand, ONERA and LS2N and LIPADE (PhD candidate)

Houda Hassini, ONERA (postdoc)

Michelangelo Mussini , ONERA (PhD candidate)

Laura Orgambide , ONERA and CNES (PhD candidate)

Etienne Senigout, ONERA (intern)