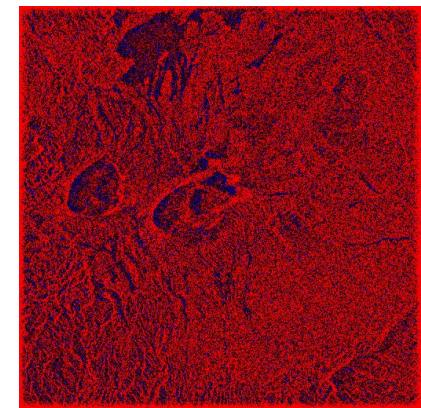


Change detection in volcano SAR images using artificial neural networks

Erik Grüner
David Luibrand



Introduction

There are approximately 1500 active volcanoes on earth.



Source: Wikipedia:Earth

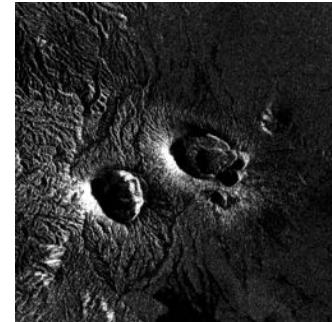
Vegetational, environmental changes affect change detection algorithms which results in a lot of false positives.



Source: Pxhere.com

Unlabeled SAR (synthetic aperture radar) data that has a lot of speckle and is hard to see small change for humans.

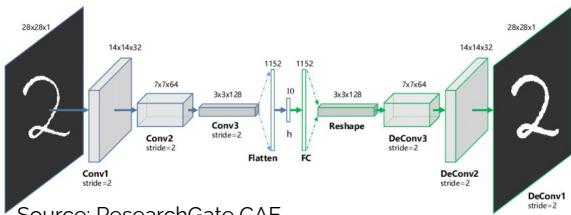
Ambrym (SAR) 2019-06-15 18:20



Source: mount-project.,com

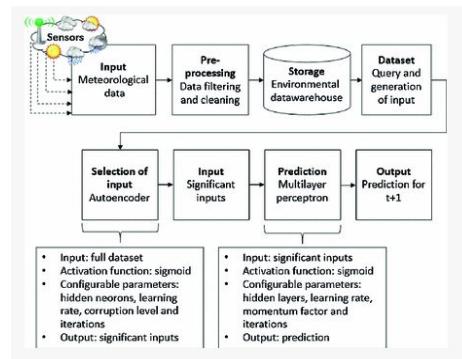
Idea

Usage of Autoencoders
to predict accurate
present from past

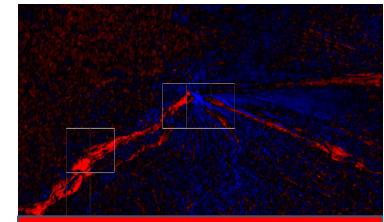


Source: ResearchGate CAE

Automation of
change detection



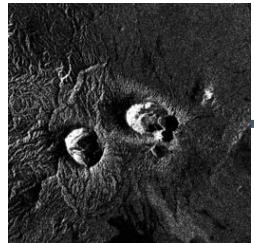
Human like change
prediction to achieve a
high recall percentage.



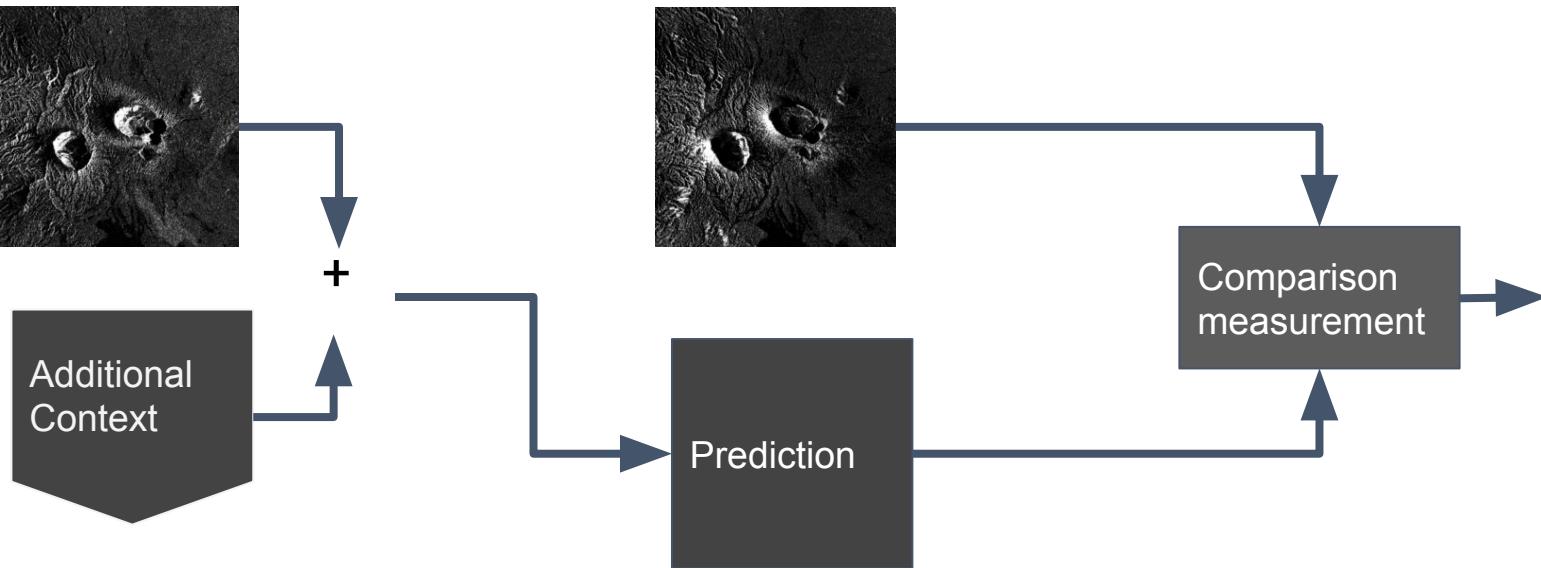
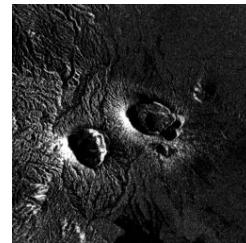
Abnormal Change
detected at date
20190625T115959

Prediction

Ambrym (SAR) 2019-06-15 18:20



Ambrym (SAR) 2019-06-17 07:12



Related Work

Change Detection in Synthetic Aperture Radar (SAR) Images Based on Deep Neural Networks

- Change detection without the use of a difference image.
- Using a deep neural network
- Classification of changed and unchanged pixels

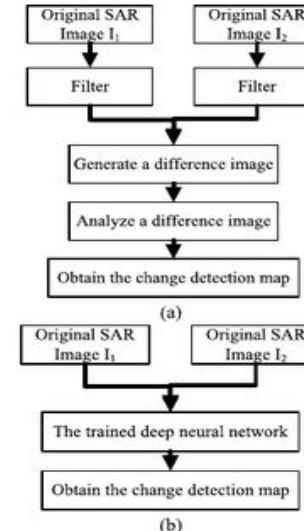


Fig. 2. Algorithm frameworks for the change detection problem.
(a) Framework based on DI-analysis. (b) Framework based on the proposed deep neural networks.

Source : Researchgate

Related Work

Rainfall Prediction: A Deep Learning Approach

- A lot of meteorological data to use as input
- Using an autoencoder to create the central hidden layer
- Use significant data as input for the prediction MLP

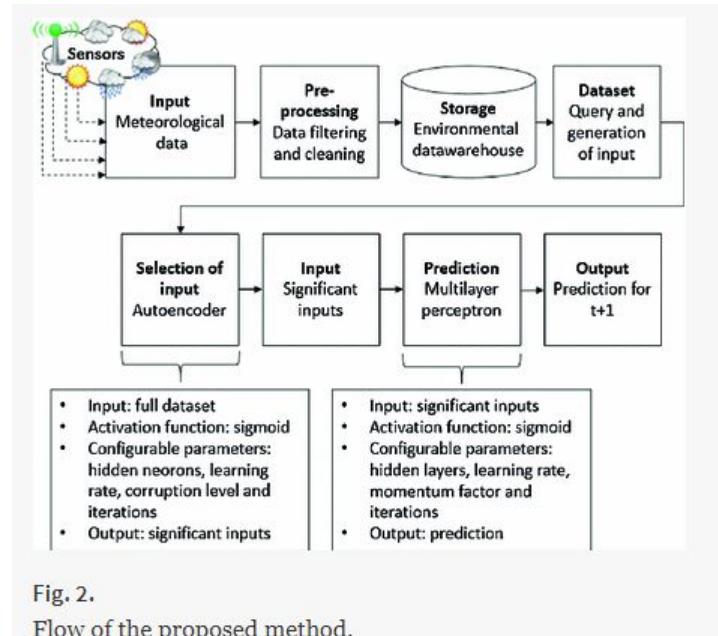


Fig. 2.
Flow of the proposed method.
Source: ResearchGate

Data

17 Volcanos, 2-4 orbits.

Totaling to 1513 unlabeled tif dataset

Surmounts to totaling ca. 135GB raw data

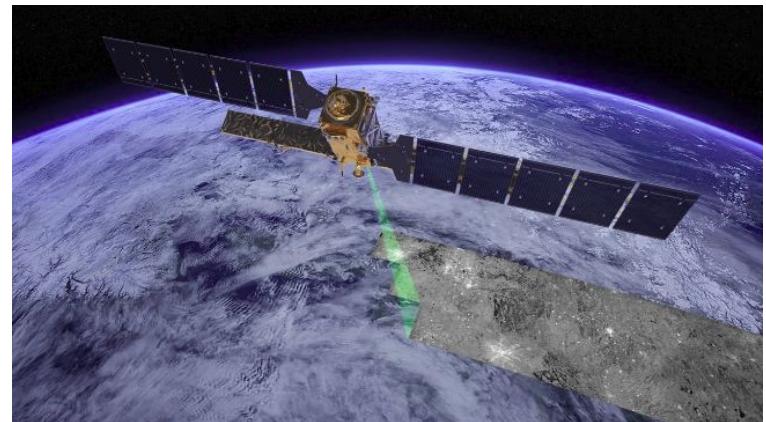


Data

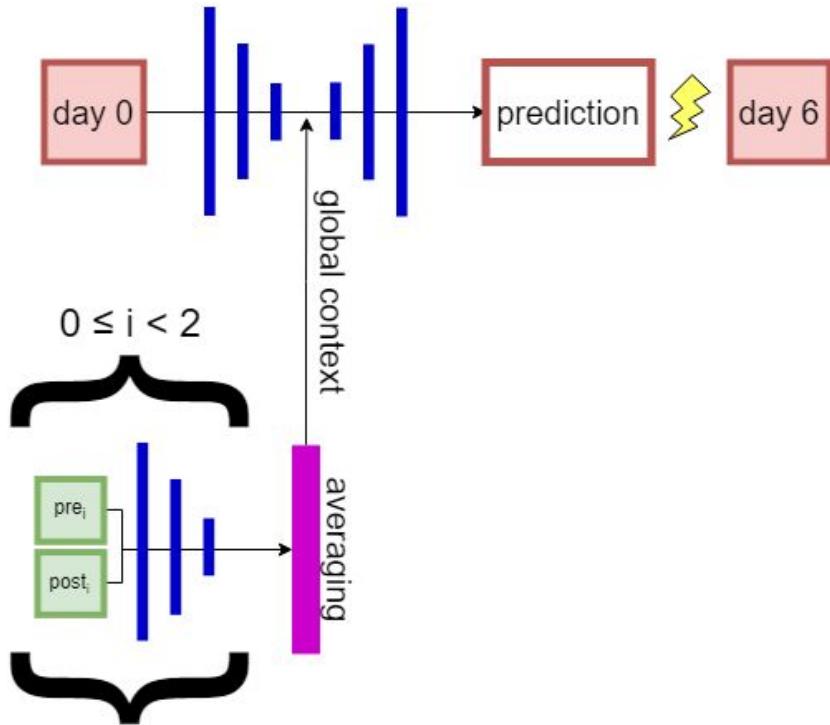
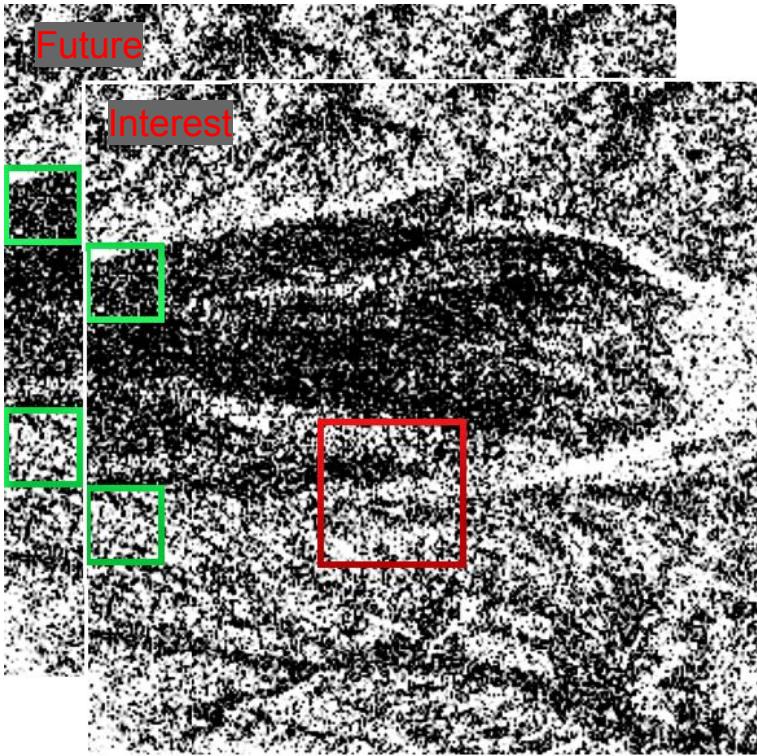
SAR is not affected by clouds nor sun illumination, but seasonal changes, rain, snow affect the radar image and gives you different images when taken at different times

Various different image sizes ranging from (800,3000)pixels to (1000,4000)

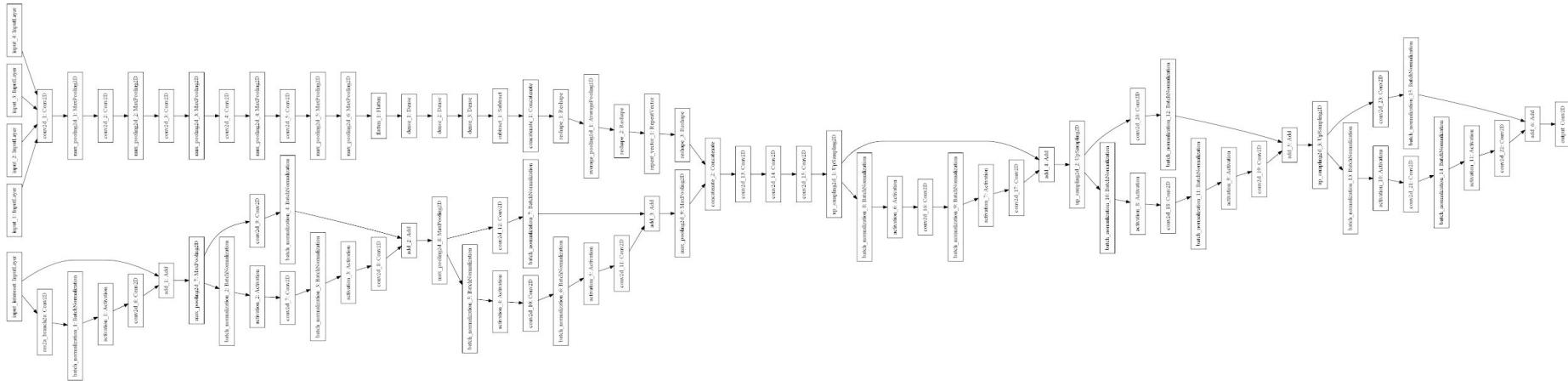
Containing 4 Channels each (VV real, VV imaginary, HH real, HH imaginary)



Architecture - Intuition

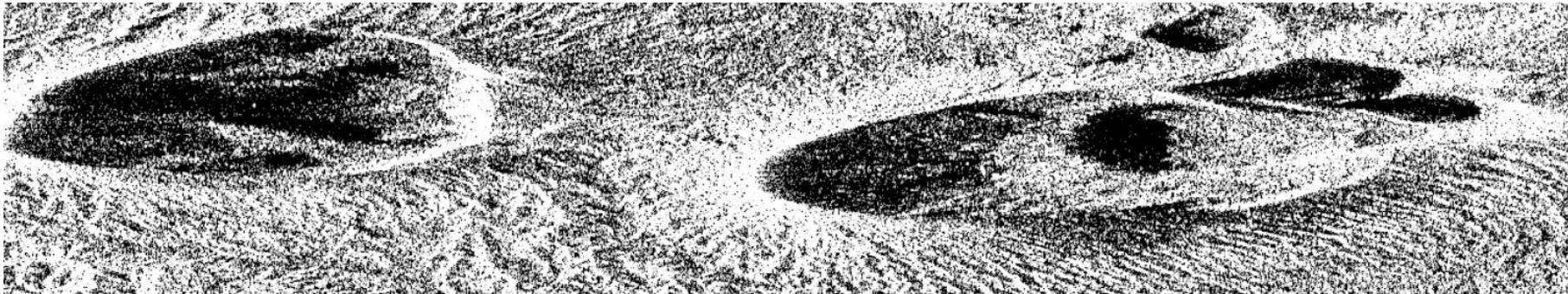


Architecture

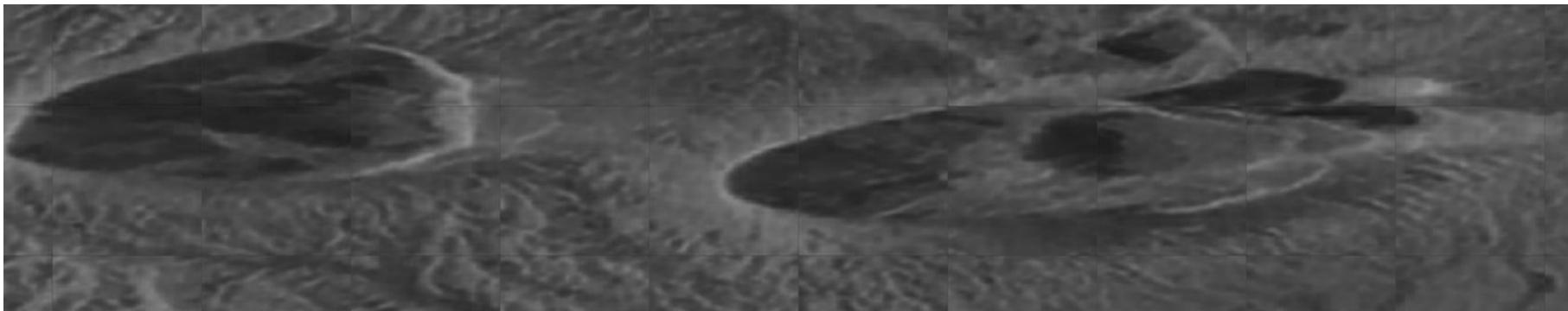


Prediction

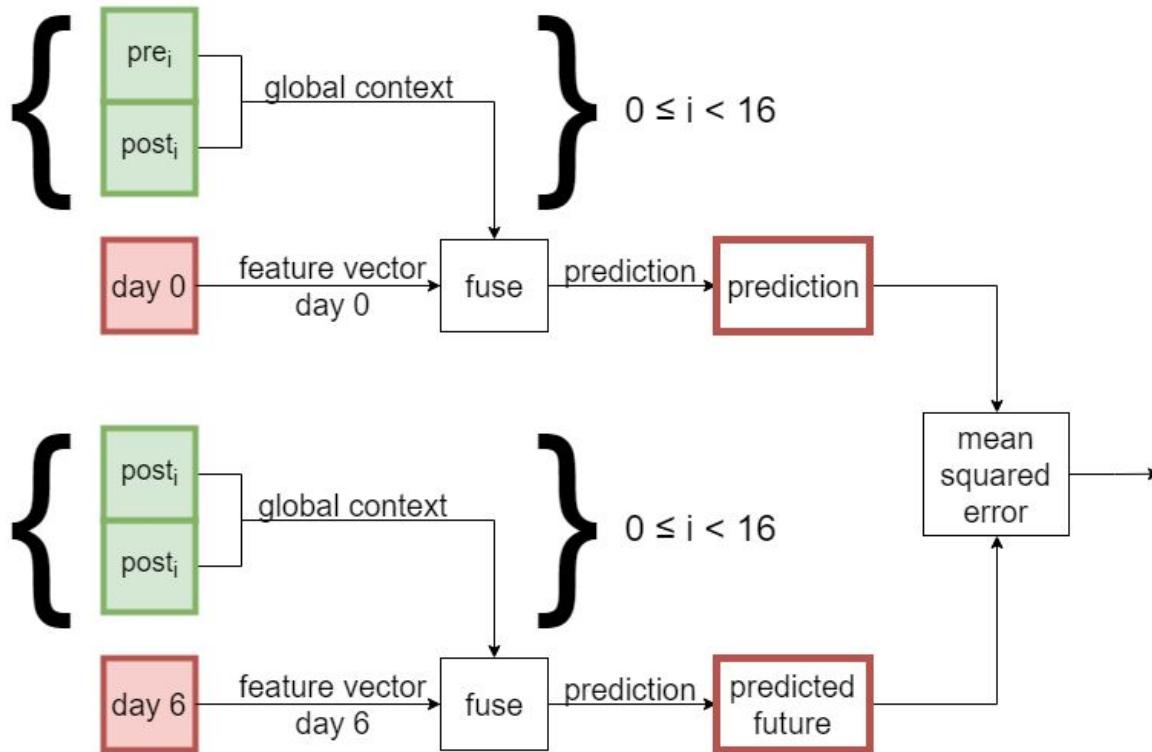
Image



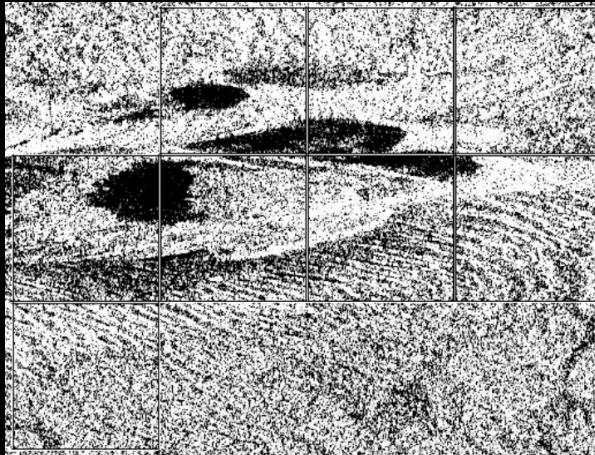
Prediction



Evaluation

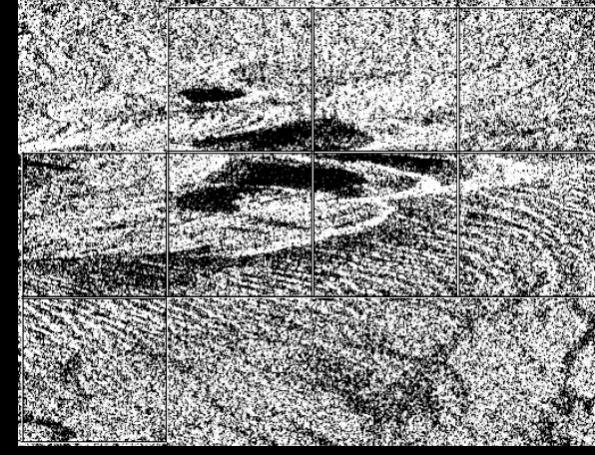


Interest

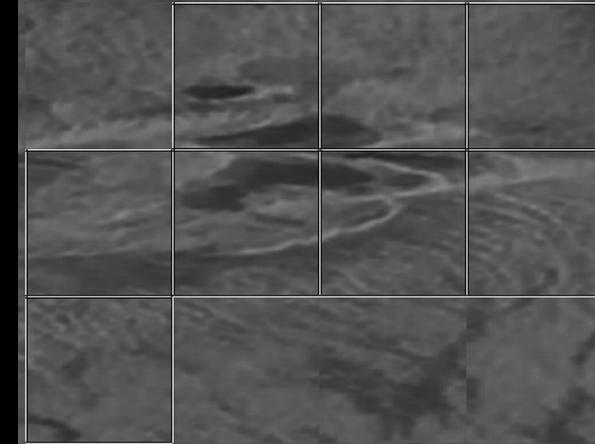
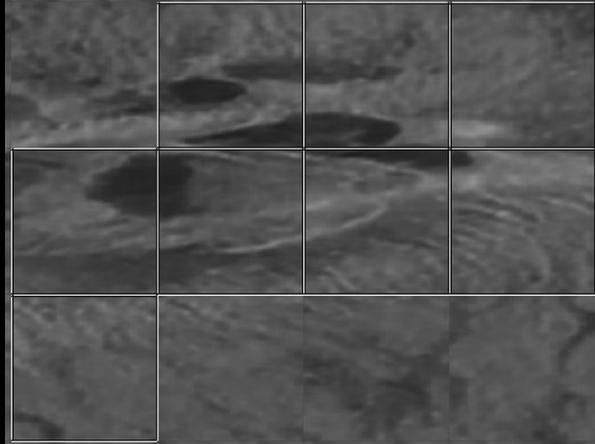


SAR

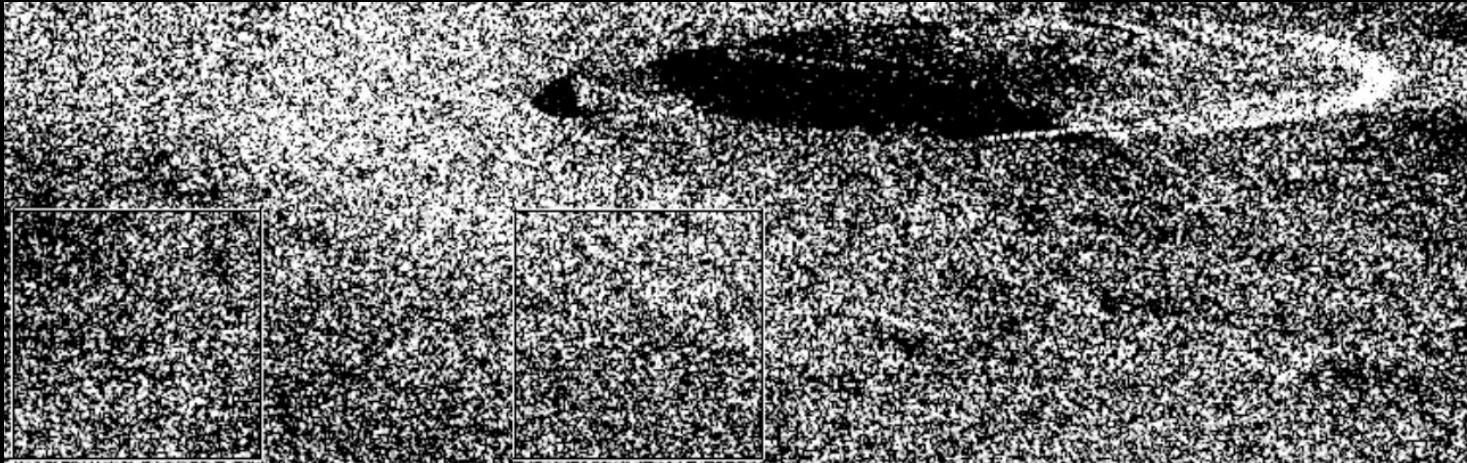
Future



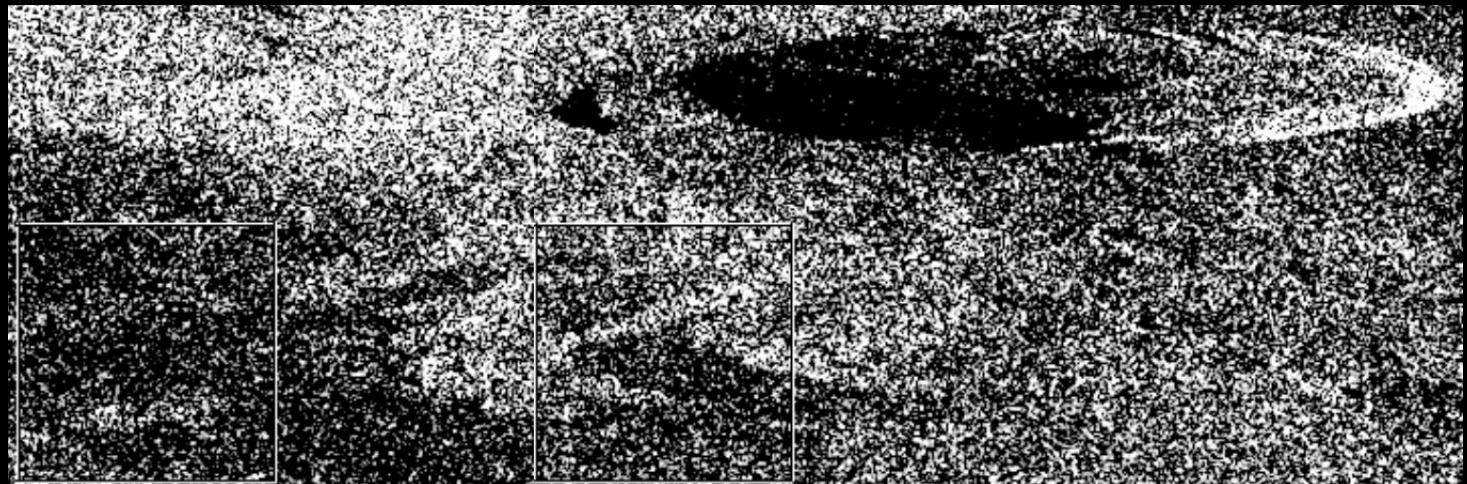
Prediction



Interest



Future



Interest



Future



Interest



Future





Thank you