MAMM Final Velocity Product

A MAMM Velocity Product consists of a README, five data files, a parameter file and the source code for two programs.

- README
- Velocity_overview.par
- Velocity_overview.conf
- Velocity_overview.dat
- Velocity_overview.dem
- Velocity_overview.img
- Velocity_overview.ind
- m_data2raster.c
- read_vmd.c

The following presentation gives a brief introduction and a validation of the Final Velocity Product

README.TXT

The README.TXT is a text file containing pertinent information regarding the final coherence overview product.

For Example:

General Information

- Definition of terminology
- Description of the directory structure (what is included with the final product)

General Description

- Final product description and a brief overview of processing steps

File Contents

- Brief explanation describing each of the items included with the final product

Programs

- List of C-programs provided with the final coherence products and an example on how to use them.

Getting started

Velocity_overview.par

The parameter file contains

- Names of the data files,
- Image dimensions,
- Upper left corner map coordinates
- Pixel spacing

Velocity_overview.conf

Conflation file contains information on all source data contributing to a point

There are 4 basic conflation methods:

Offsets only – Azimuth offsets

The refined baseline and a DEM is used to remove the DEM deduced azimuth and slant range components from the original offsetmap

Azimuth offset – Range phase

In addition to the offsetmap the phase image of the interferogram is also used for the velocity estimation

Azimuth – Azimuth offset only

The ascending and descending interferograms of the same site are used. This mode uses the azimuth offset only to calculate the velocities.

Range – Unwrapped phase only

The ascending and descending interferograms of the same site are used. This mode uses the unwrapped phase only for the velocity map calculation.

The conflation index can be extracted using the read_vmd.c code

Velocity_overview.dat

The data is a binary file containing:

float magnitude	velocity magnitude
float elevation	elevation
float slope_x	east component of slope
float slope_y	west component of slope
float Vx	east component of velocity
float Vy	north component of velocity
float Vz	vertical component of velocity
float speed err	speed error
float direction err	directional error

The next series of slides give a visual example of each of the data files

M
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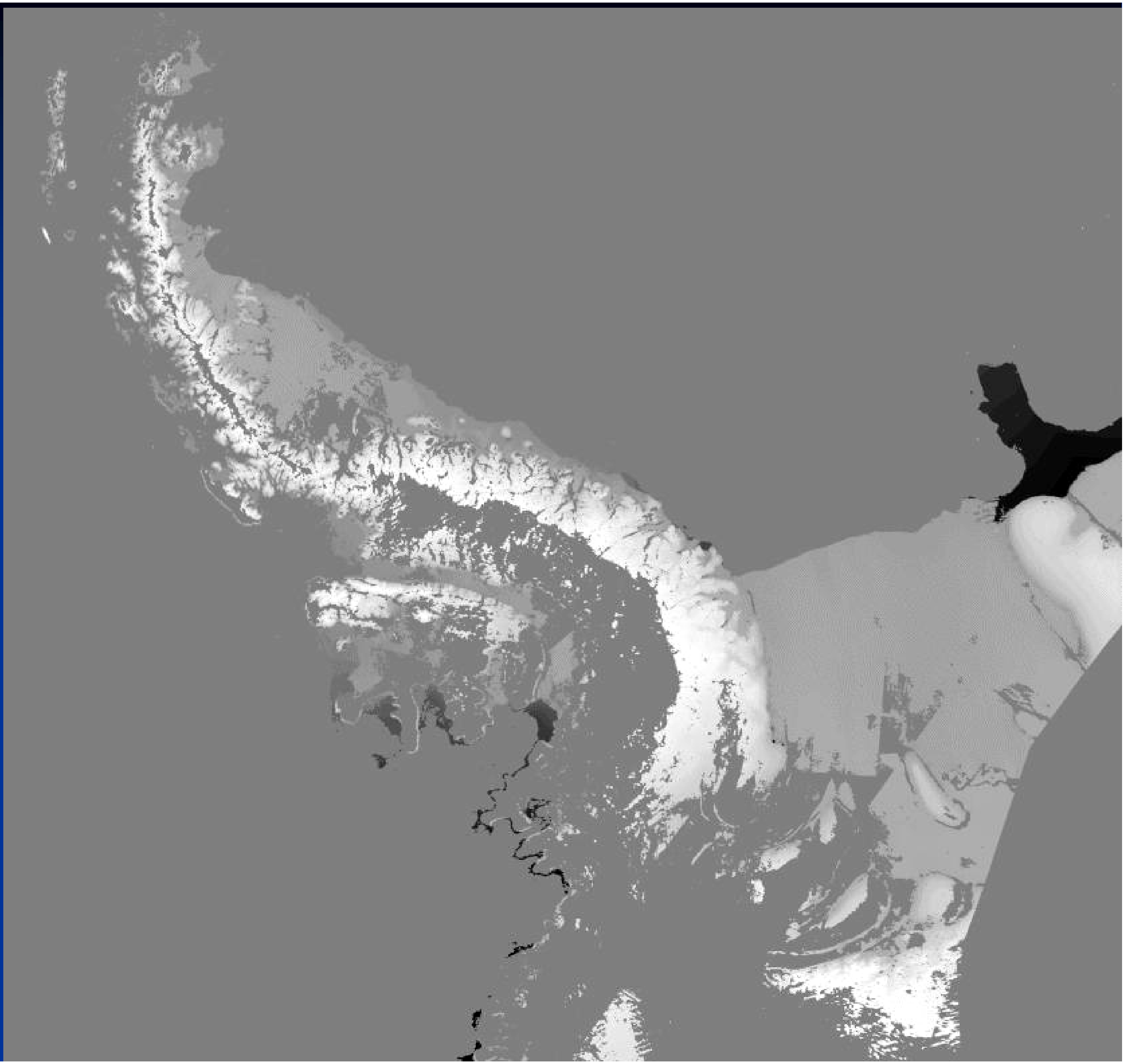
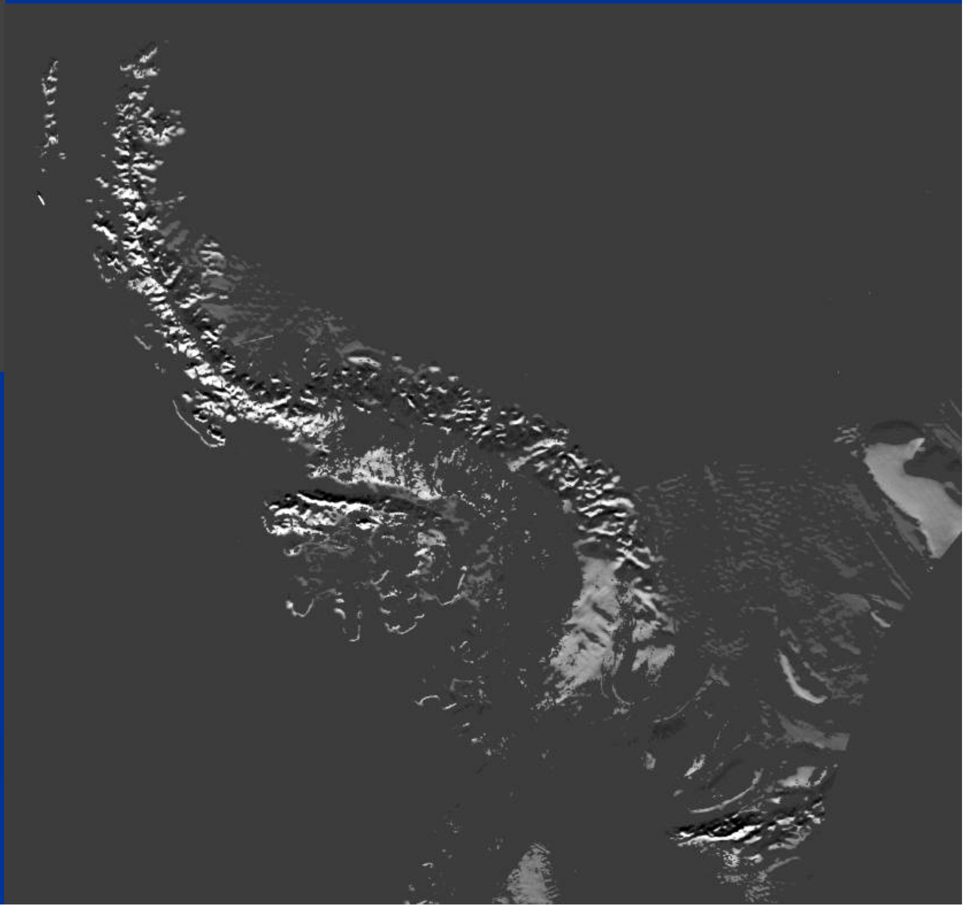
E L E V A T I O N



SLOPE X

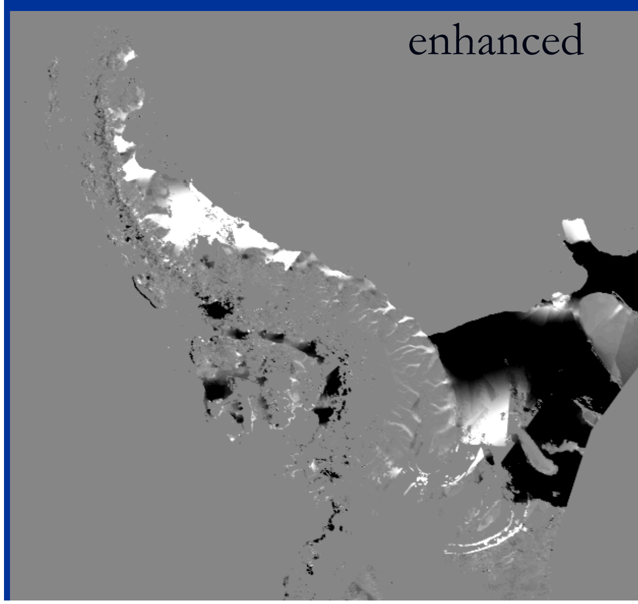


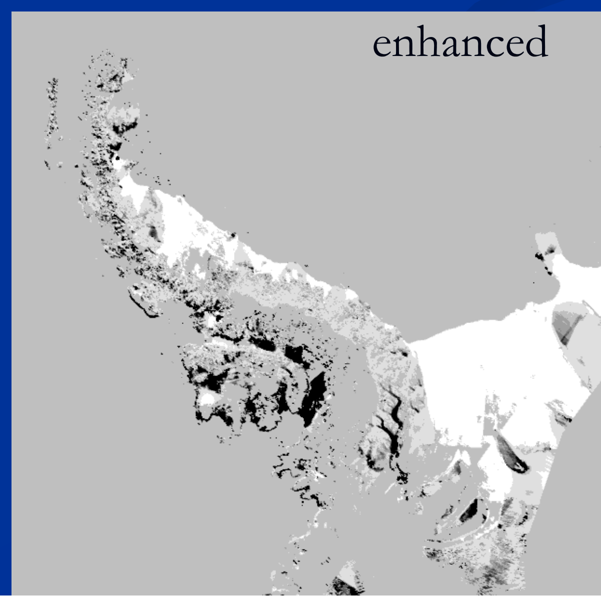
SLOPE Y

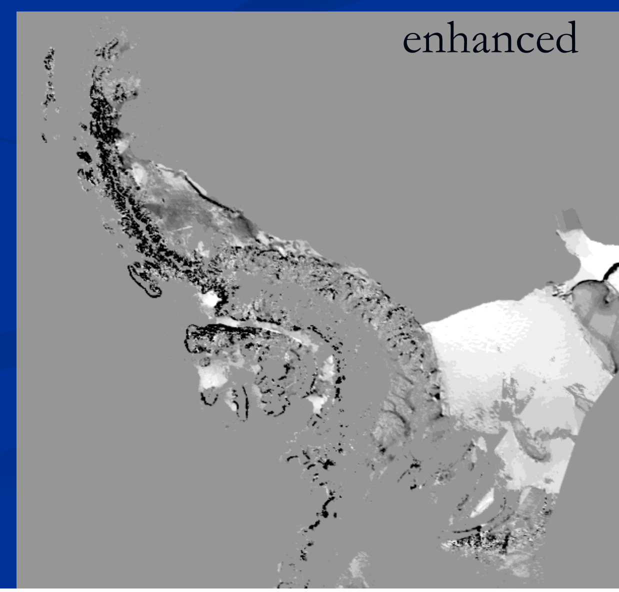
Vx
East Component

Vy
North Component

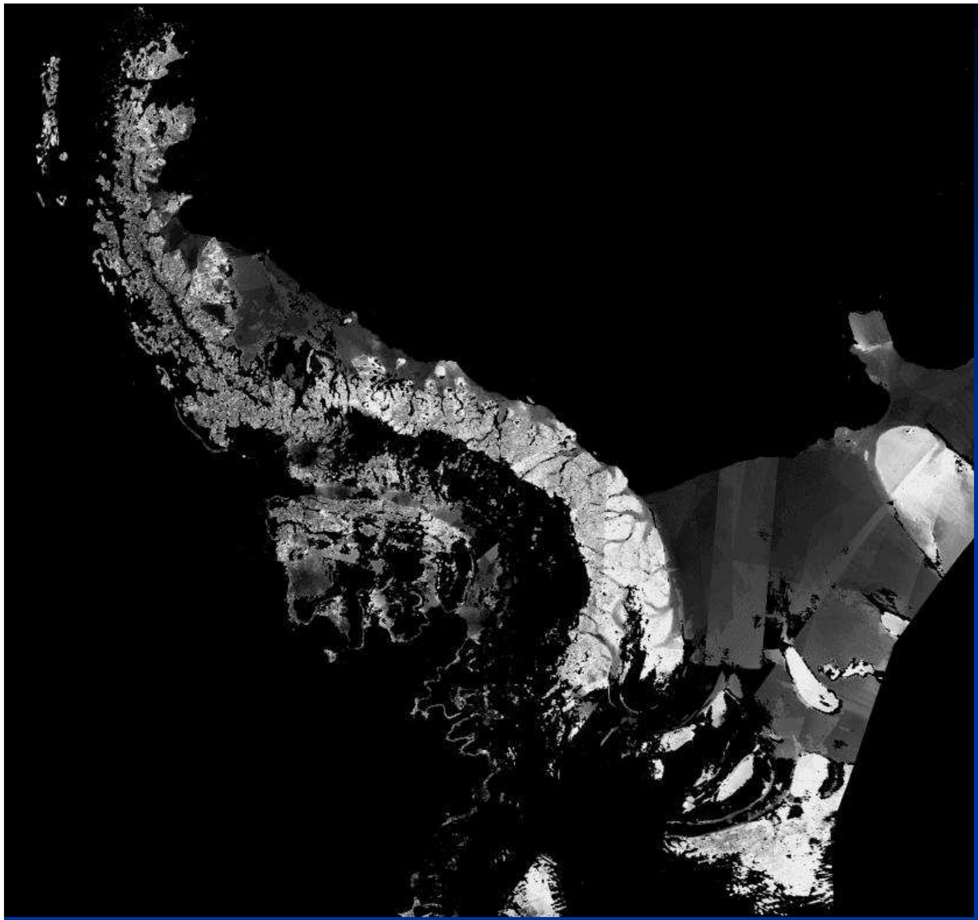
Vz
Vertical Component

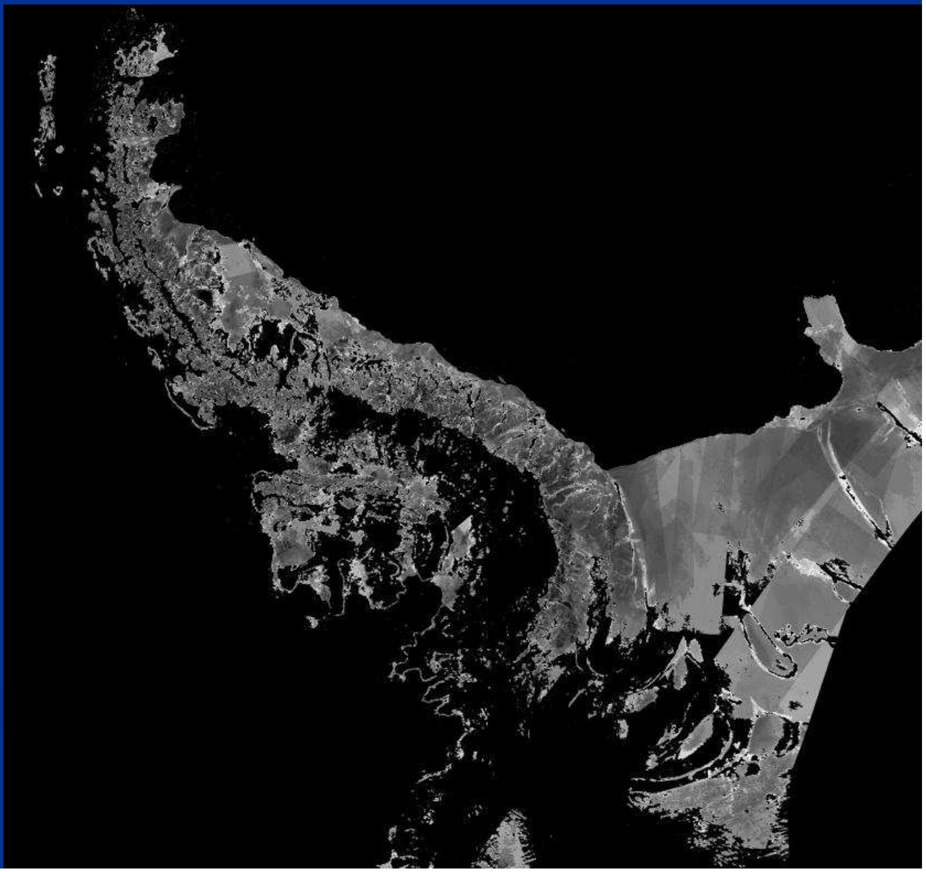


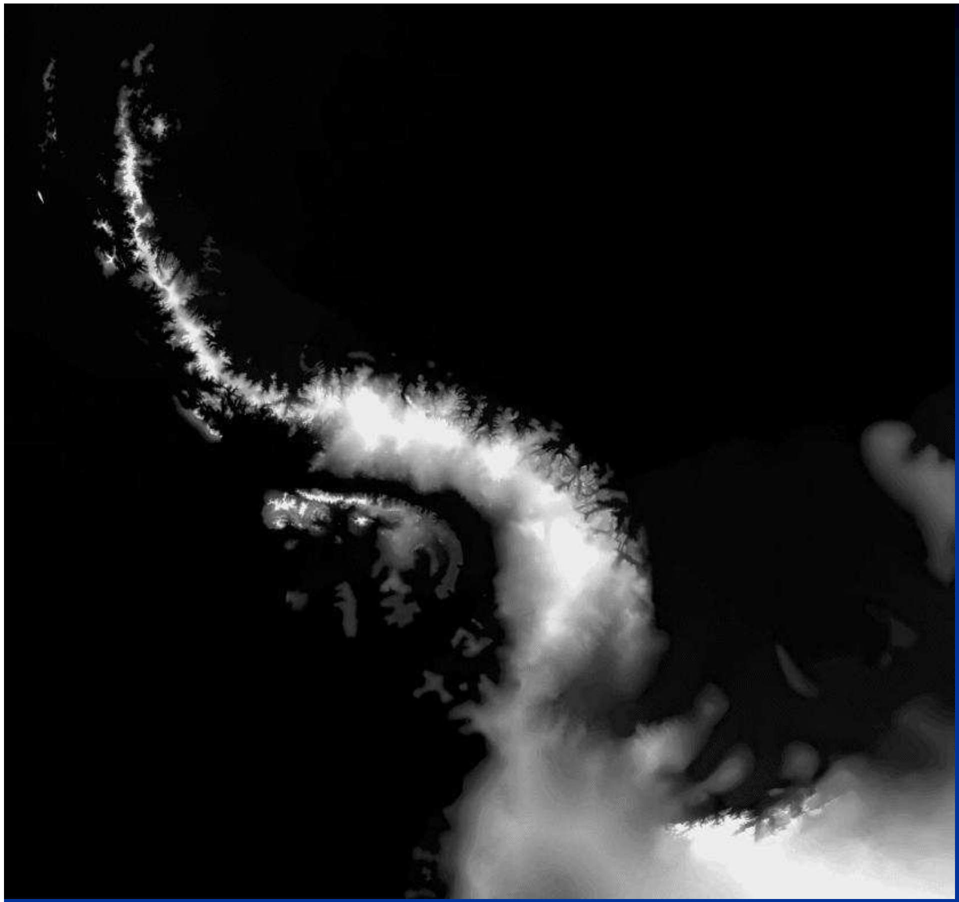




Directional Error

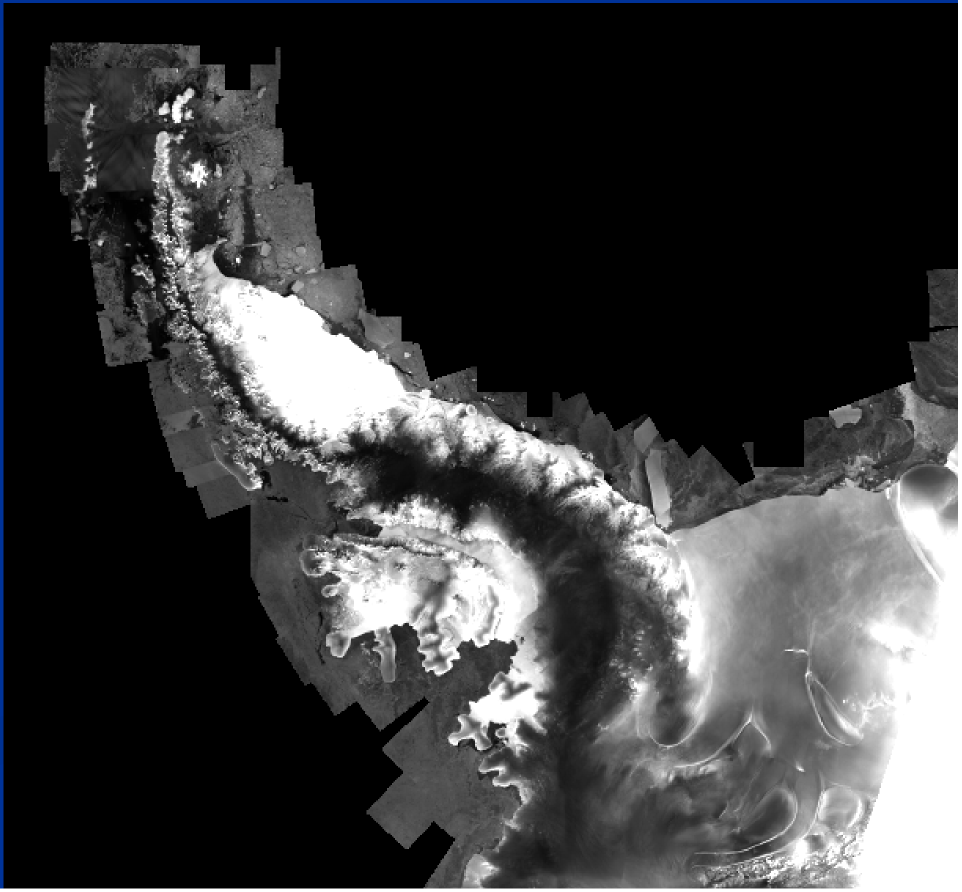






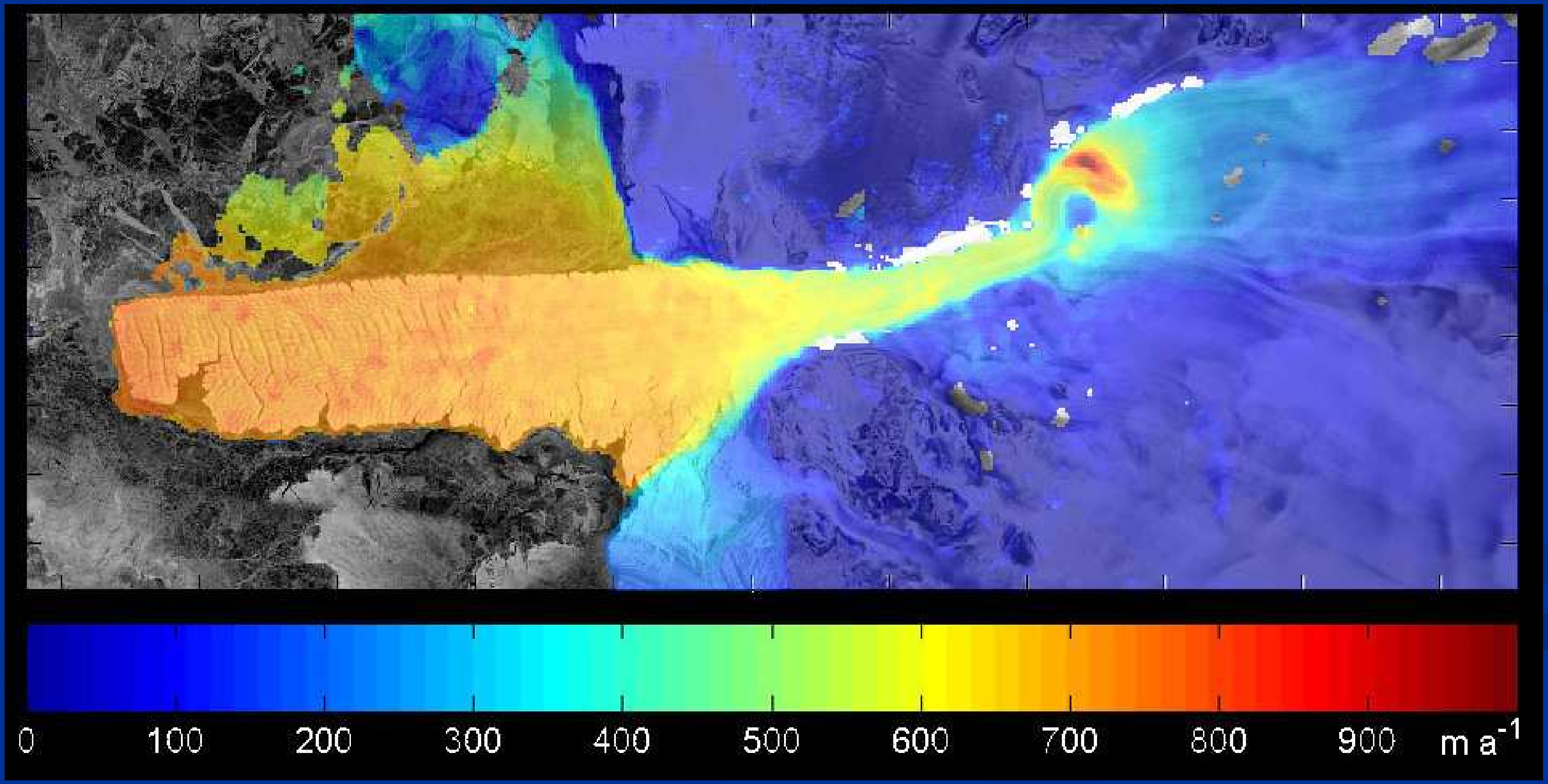
DEM
16 bit signed binary

IMAGE
16 bit unsigned binary

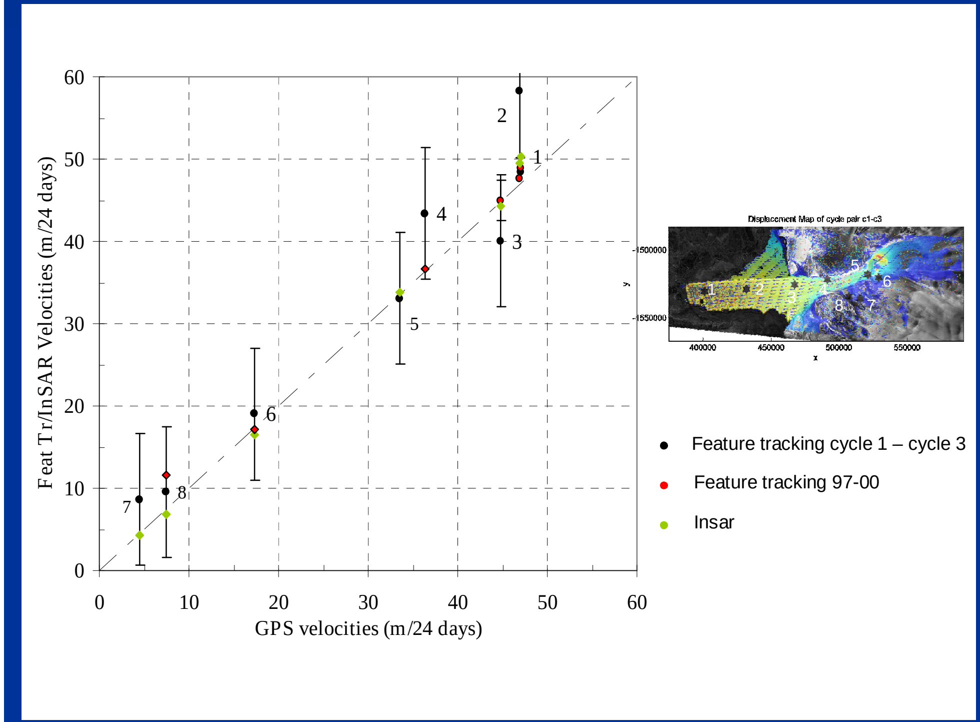


Velocity Validation

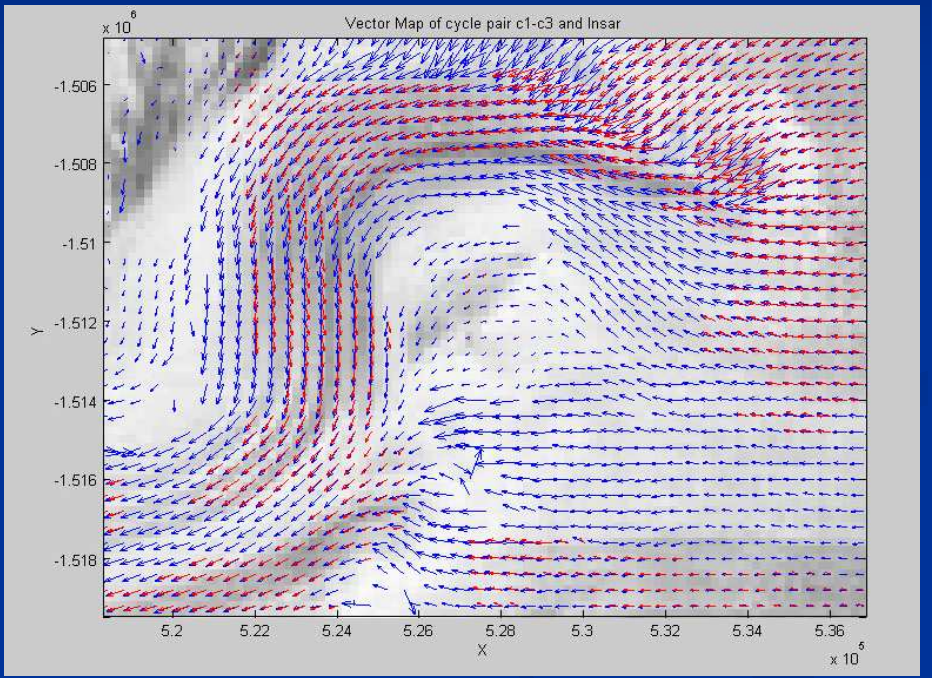
We validated our velocity results based on a study of the Drygalski Ice Tongue and David Glacier. We compared InSAR results with velocities deduced using a feature retracking algorithm and with available in situ data.



The scatter plot below shows ground based GPS measurements plotted against the value of the closest pixel of derived feature tracking and InSAR velocities. Considering the differences in methods there is a remarkably good agreement. We do see that the short term feature tracking velocities seemed to be systematically higher then the other values. We attribute this artifact to uncertainties in co-registration.



Comparison of derived velocities with in situ GPS measurements. Locations of measurements are indicated on the right (source: Velmap database; Frezotti, 1998).



Feature retracking (blue) and InSAR (red) velocity vectors around the 'Cauldron' of David Glacier.

Speed and direction errors for InSAR data of David Glacier and the Drygalski Ice Tongue.