

TanDEM-X observations over the Petermann Gletscher glacier northern Greenland

XTI_GLAC0296

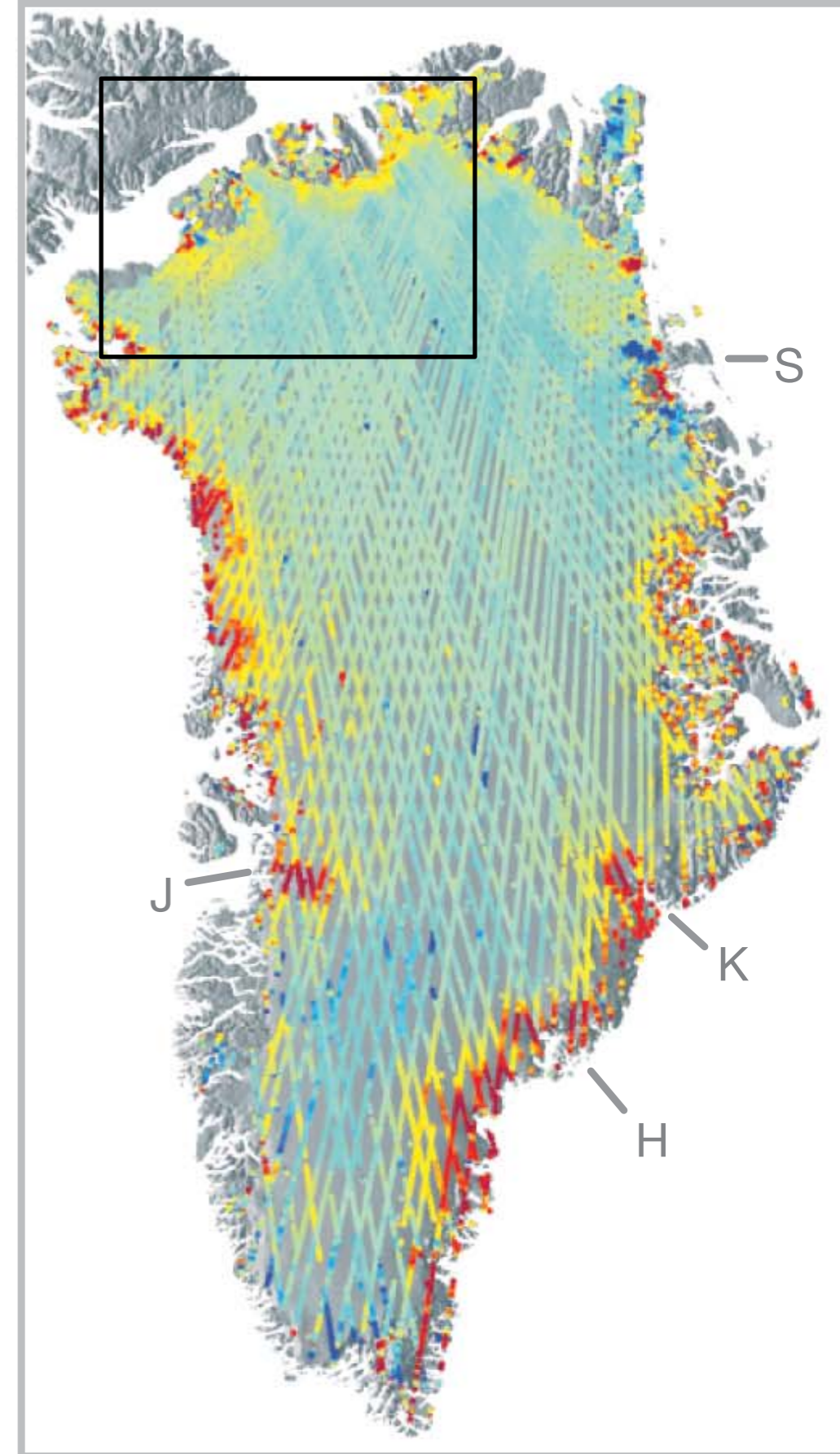
Noel Gourmelen, University of Edinburgh



TanDEM-X science team meeting
10-14 June 2013



Greenland surface elevation change as seen from IceSat



Pritchard et al., 2009

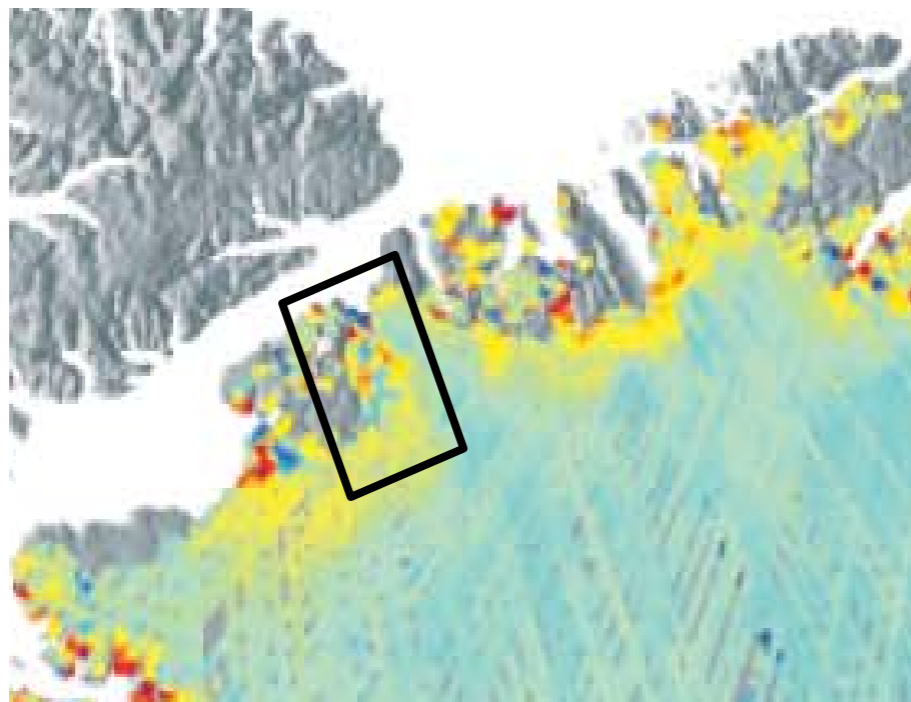


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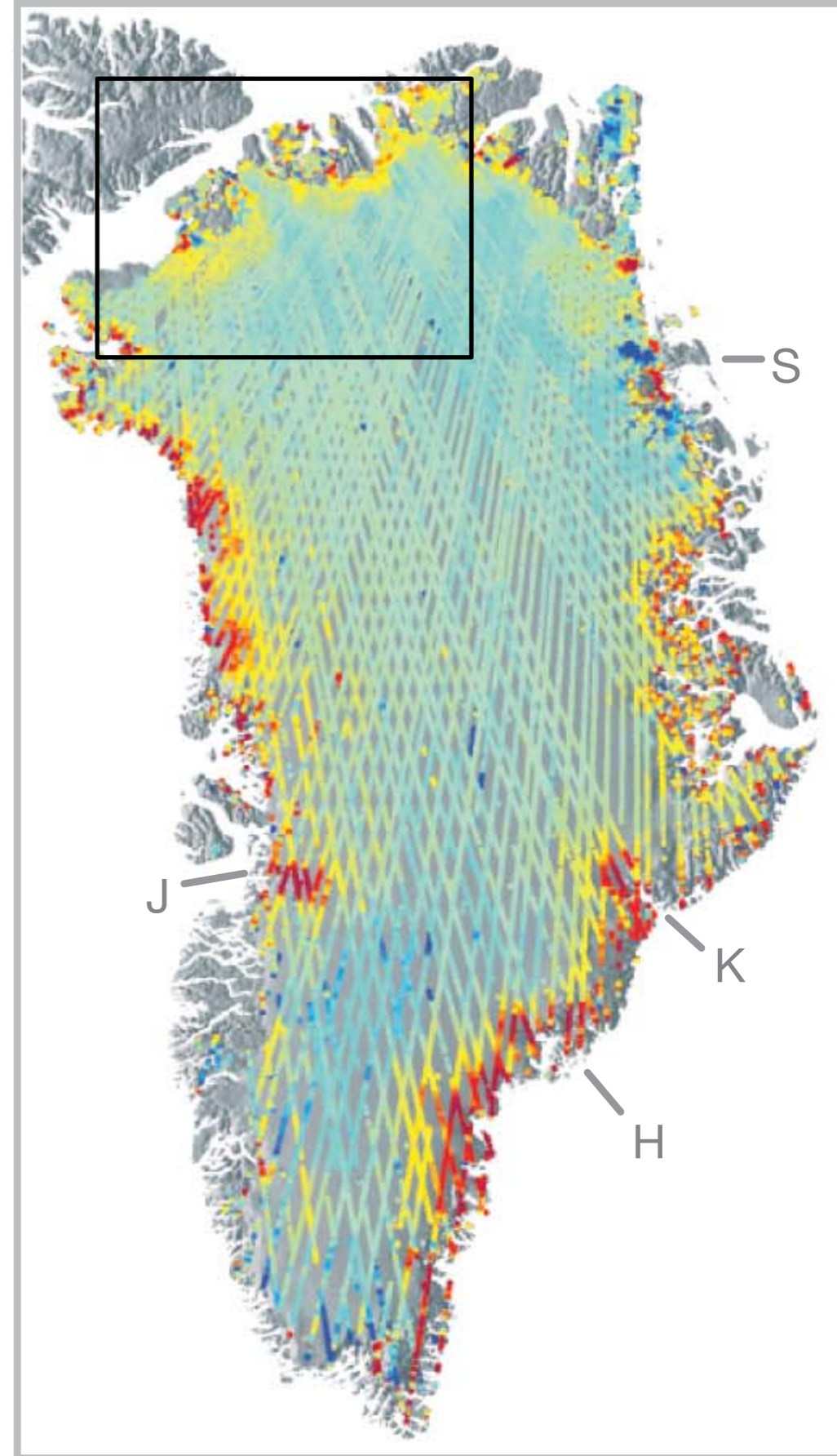


Greenland surface elevation change as seen from IceSat

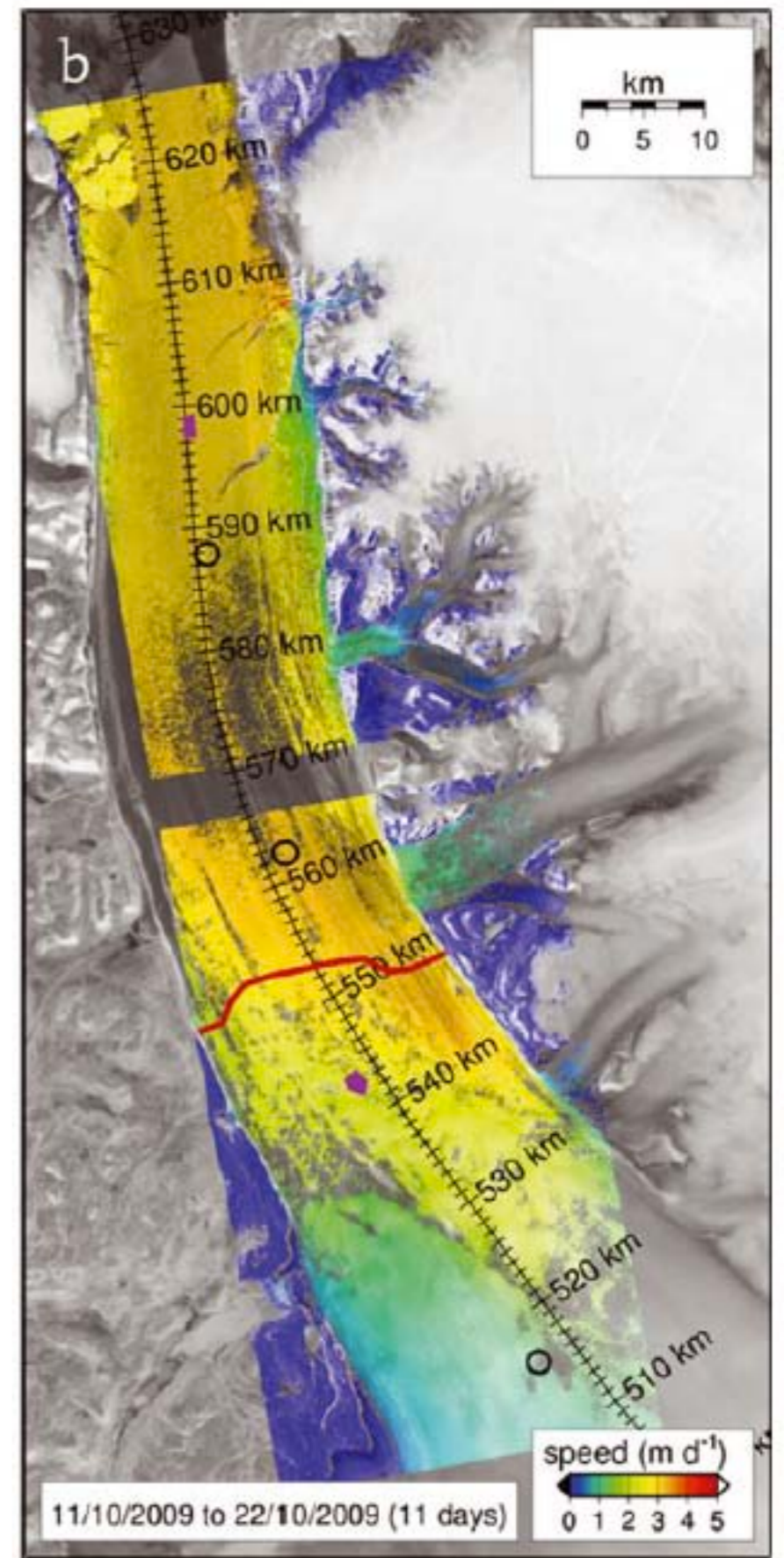
No clear signal of elevation change over Petermann Gletscher



Pritchard et al., 2009



No change in velocity of the Petermann Gletscher



Nick et al., 2012



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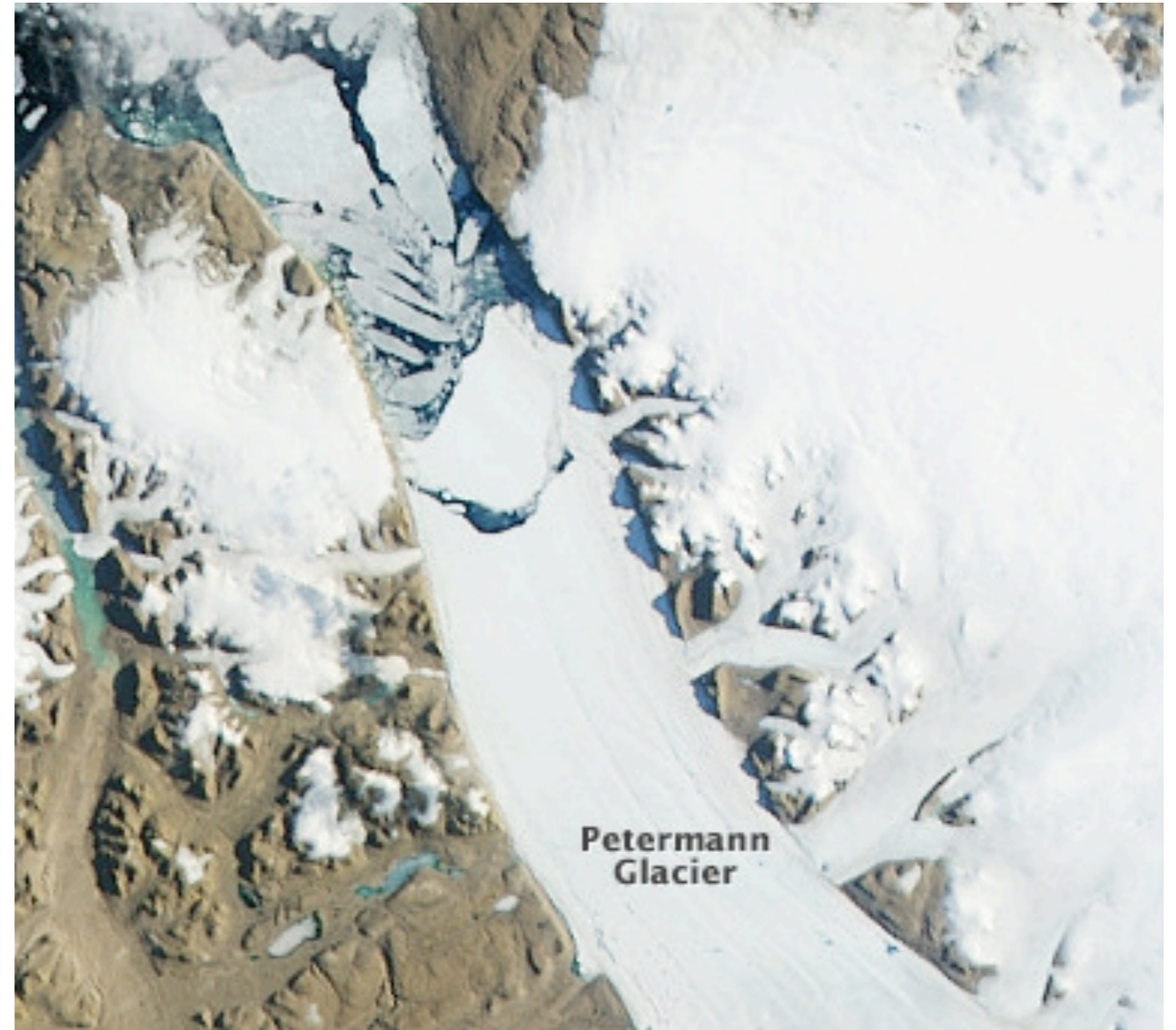
Large calving events in 2010 and 2012

2010 calving event



NASA

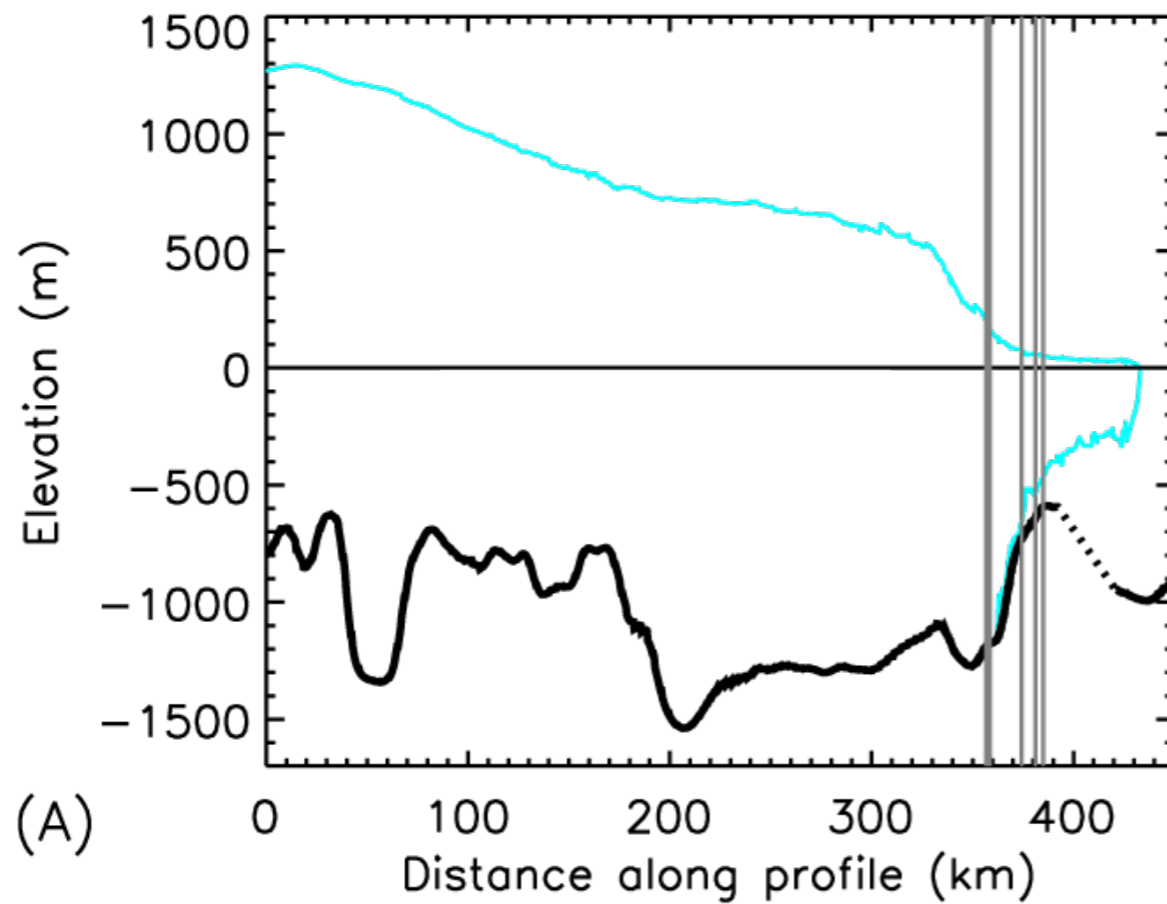
2012 calving event



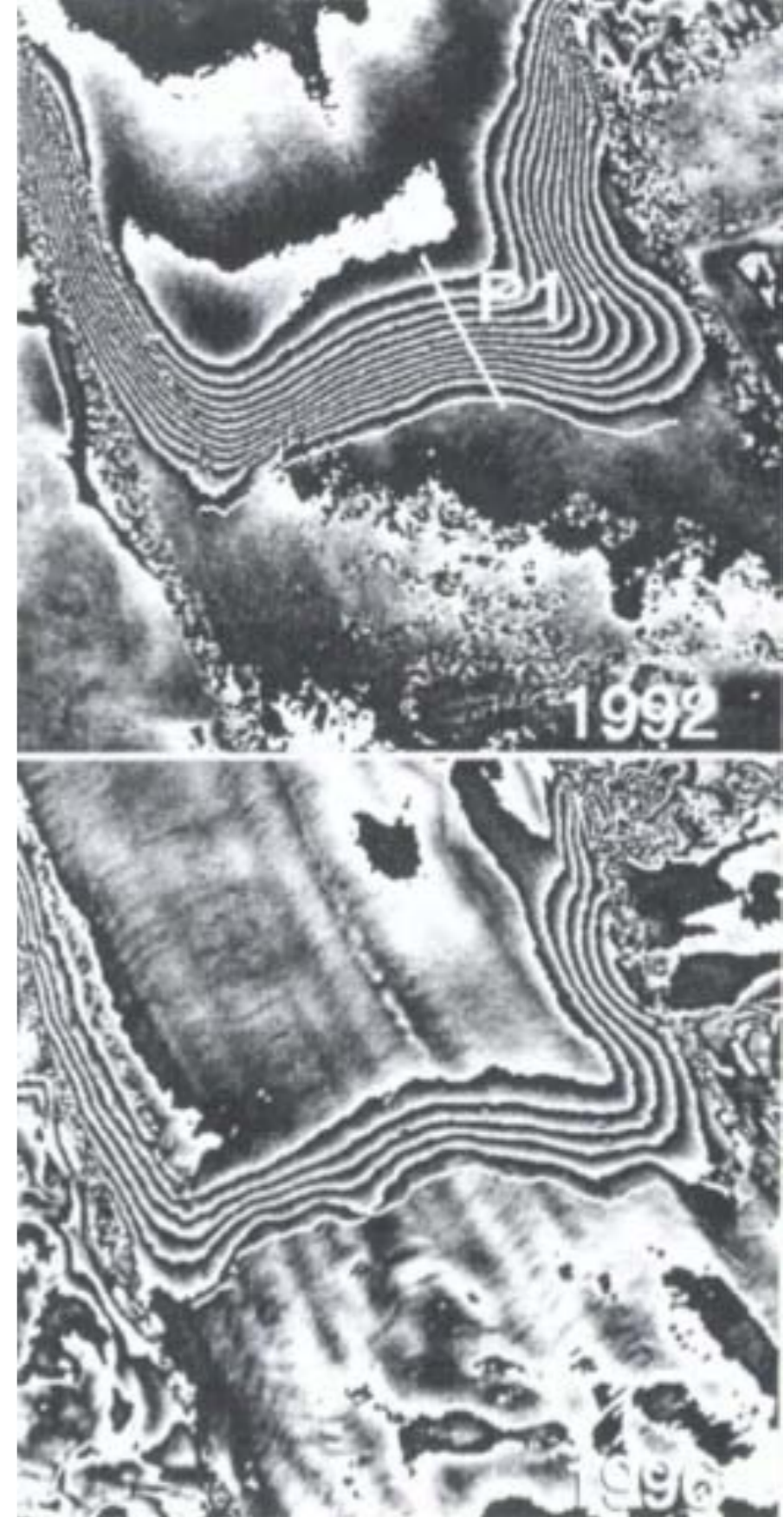
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Grounding line retreat



Rignot, 1998

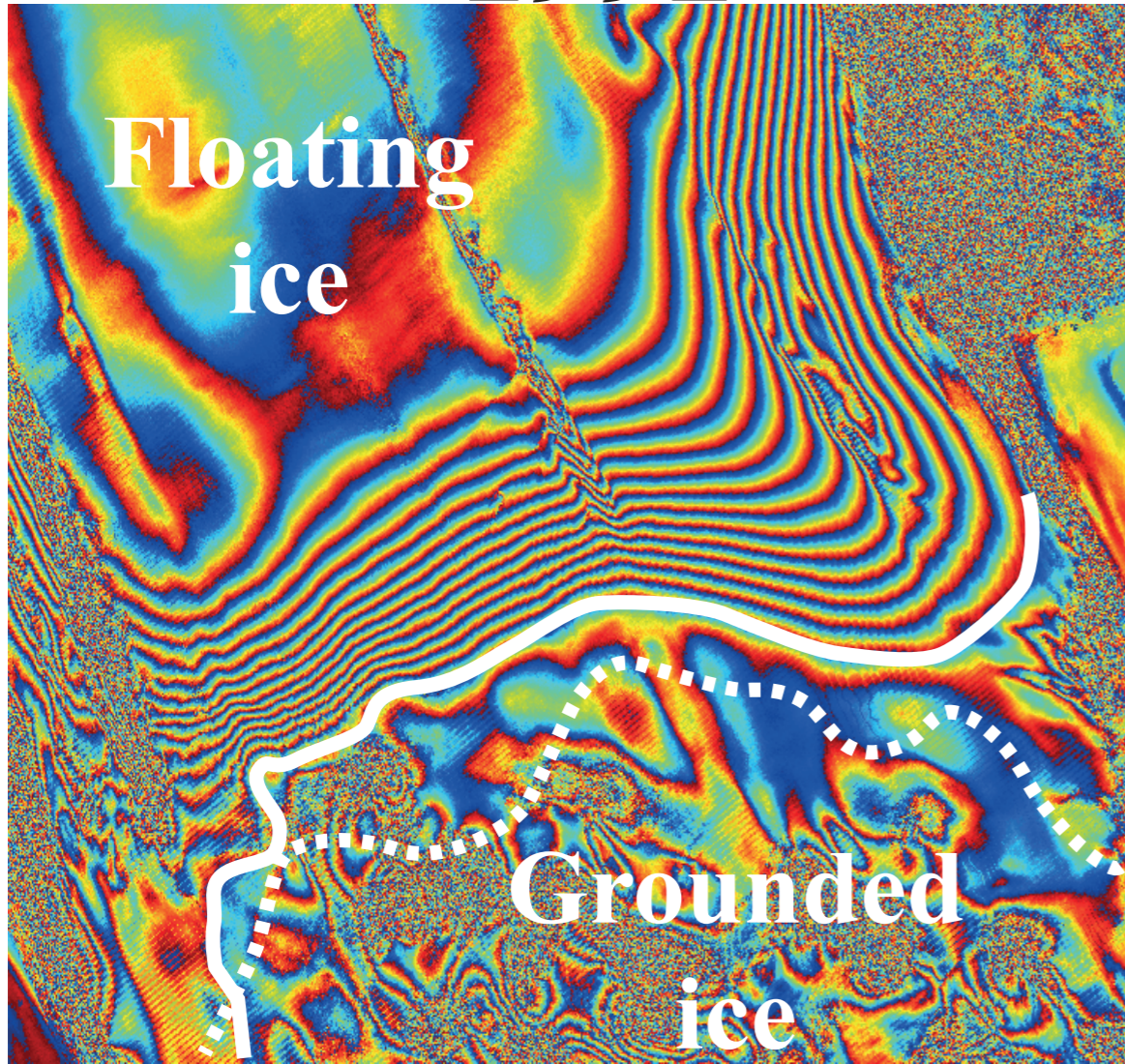


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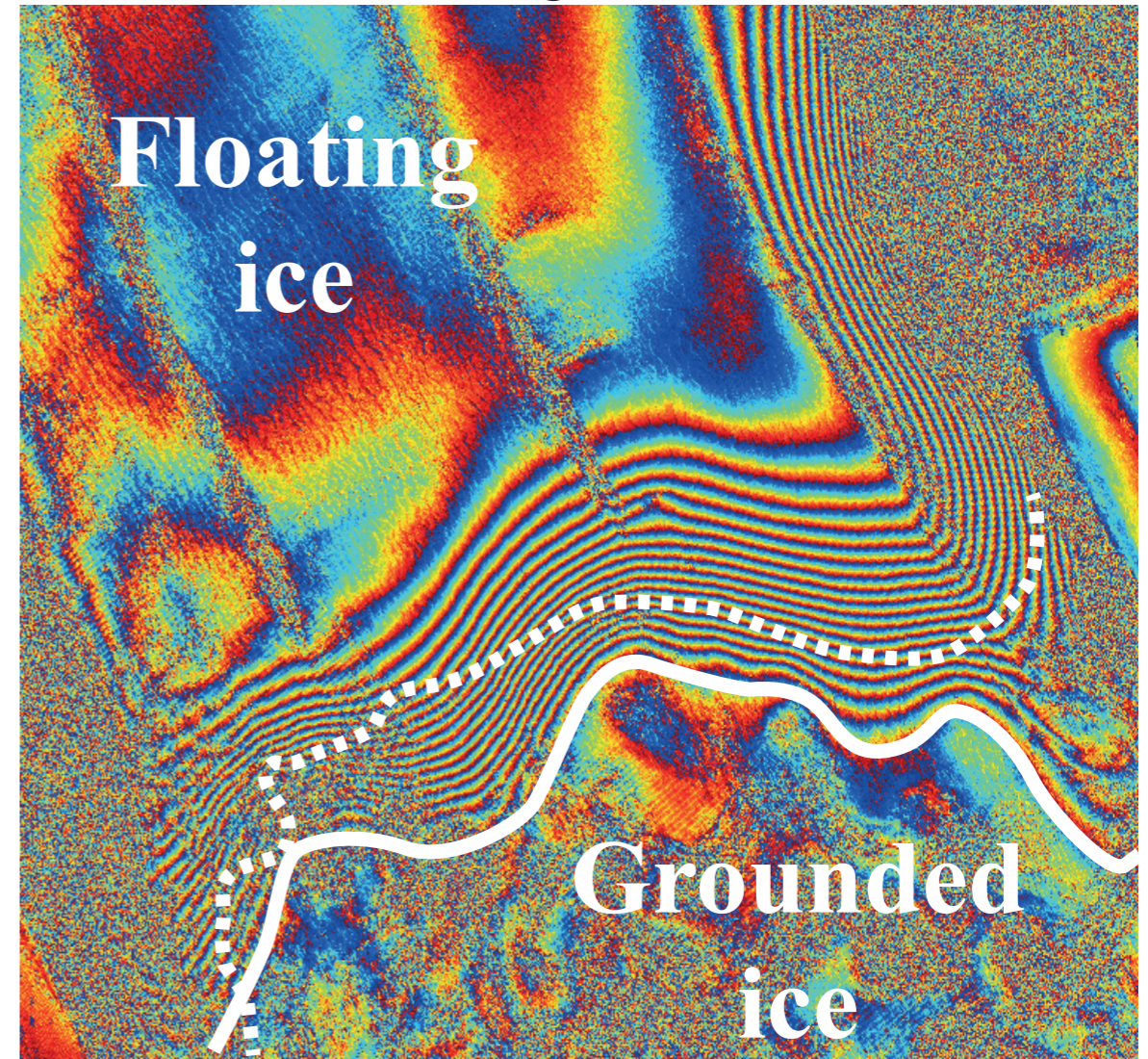


Grounding line retreat

1992



2011



..... 2011 Grounding Line position

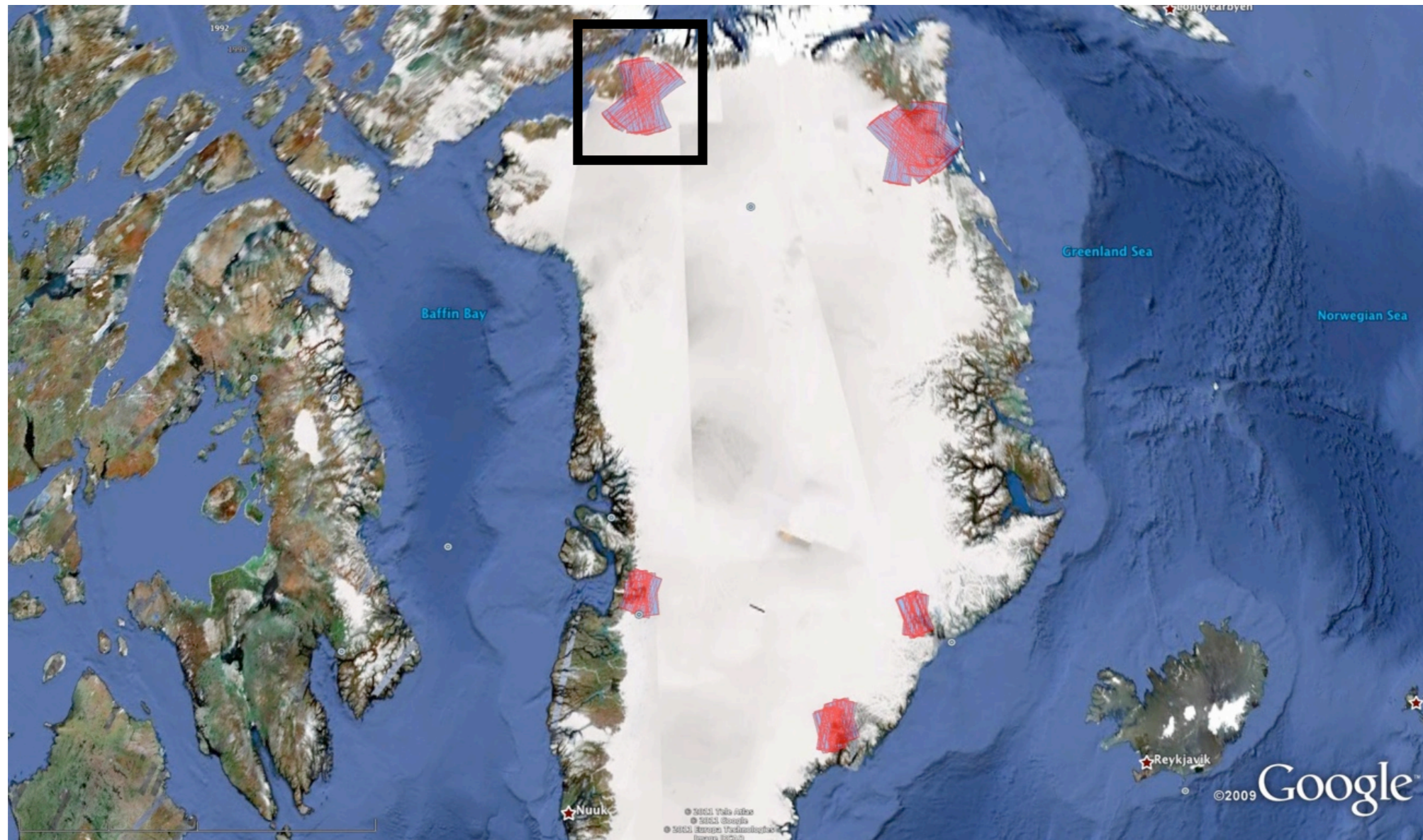
2 km

..... 1992 Grounding Line position

TanDEM-X acquisitions

XTI_GLAC0296

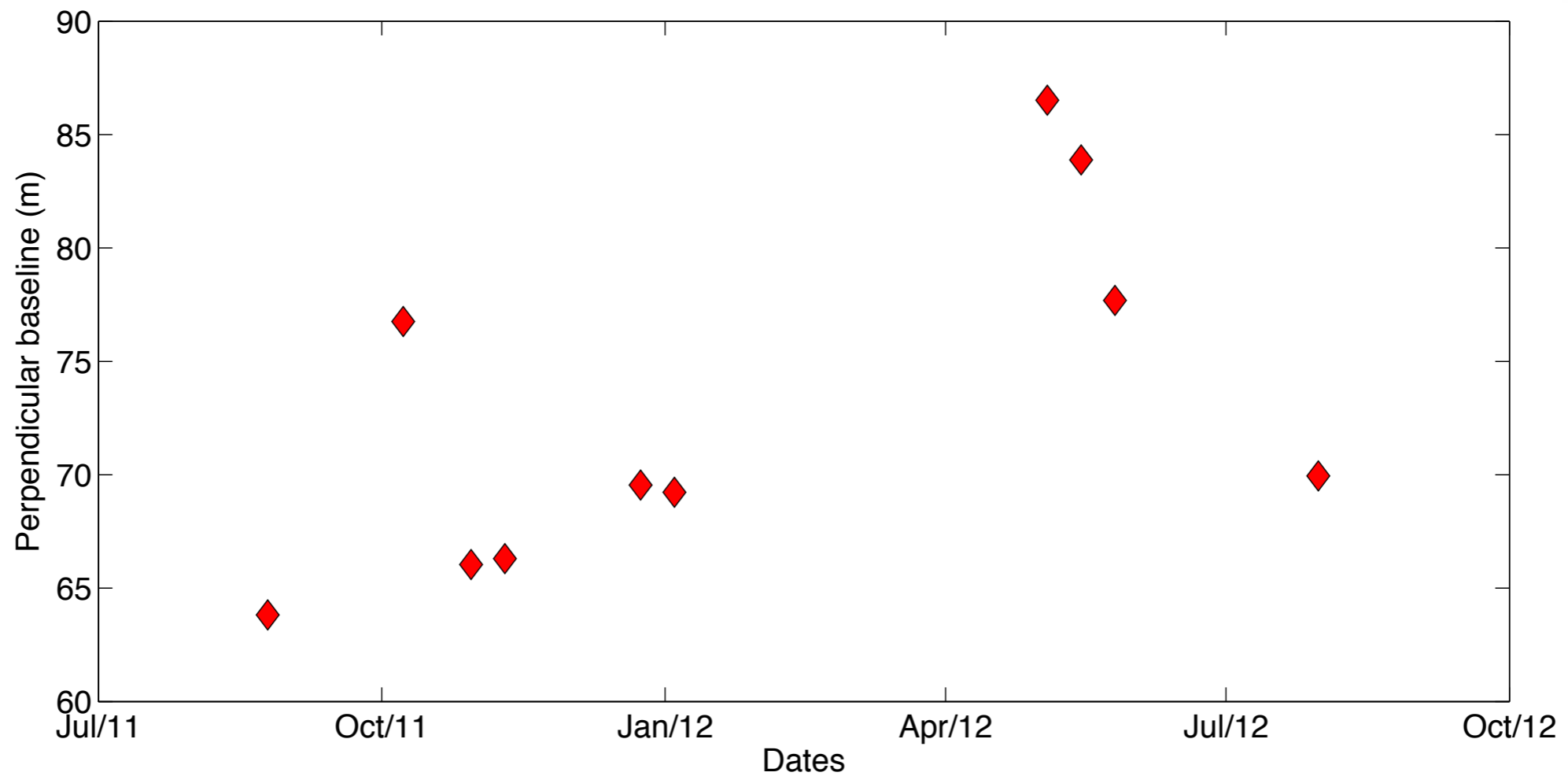
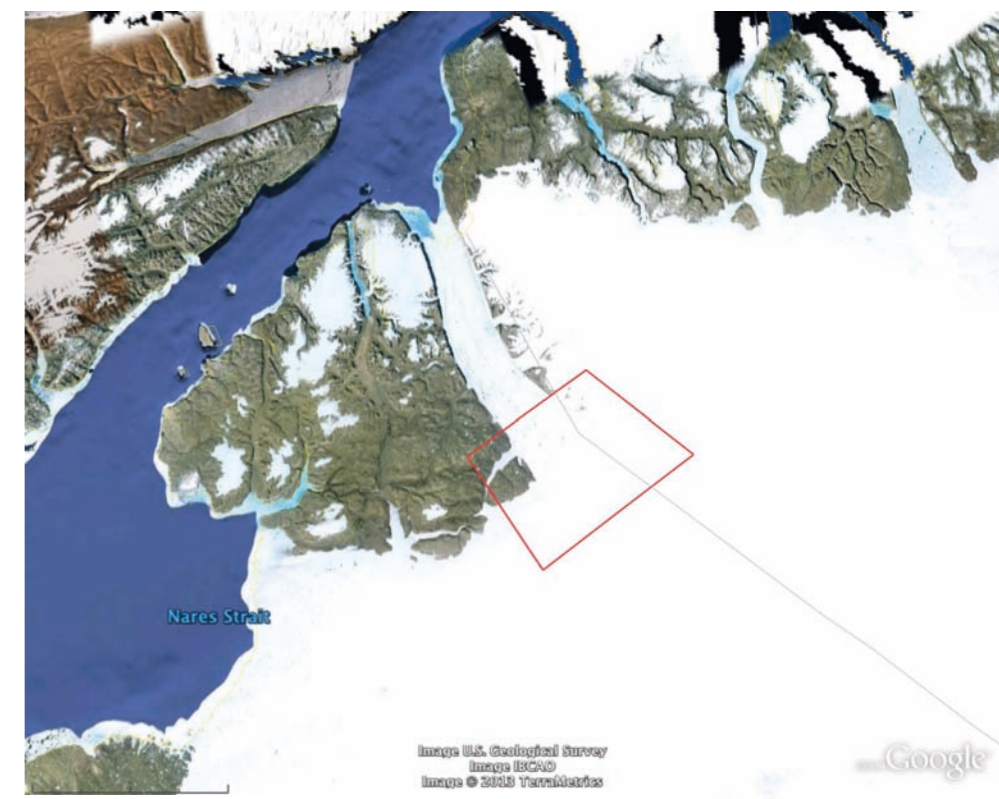
Greenland super-sites - Bistatic mode



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TanDEM-X acquisitions

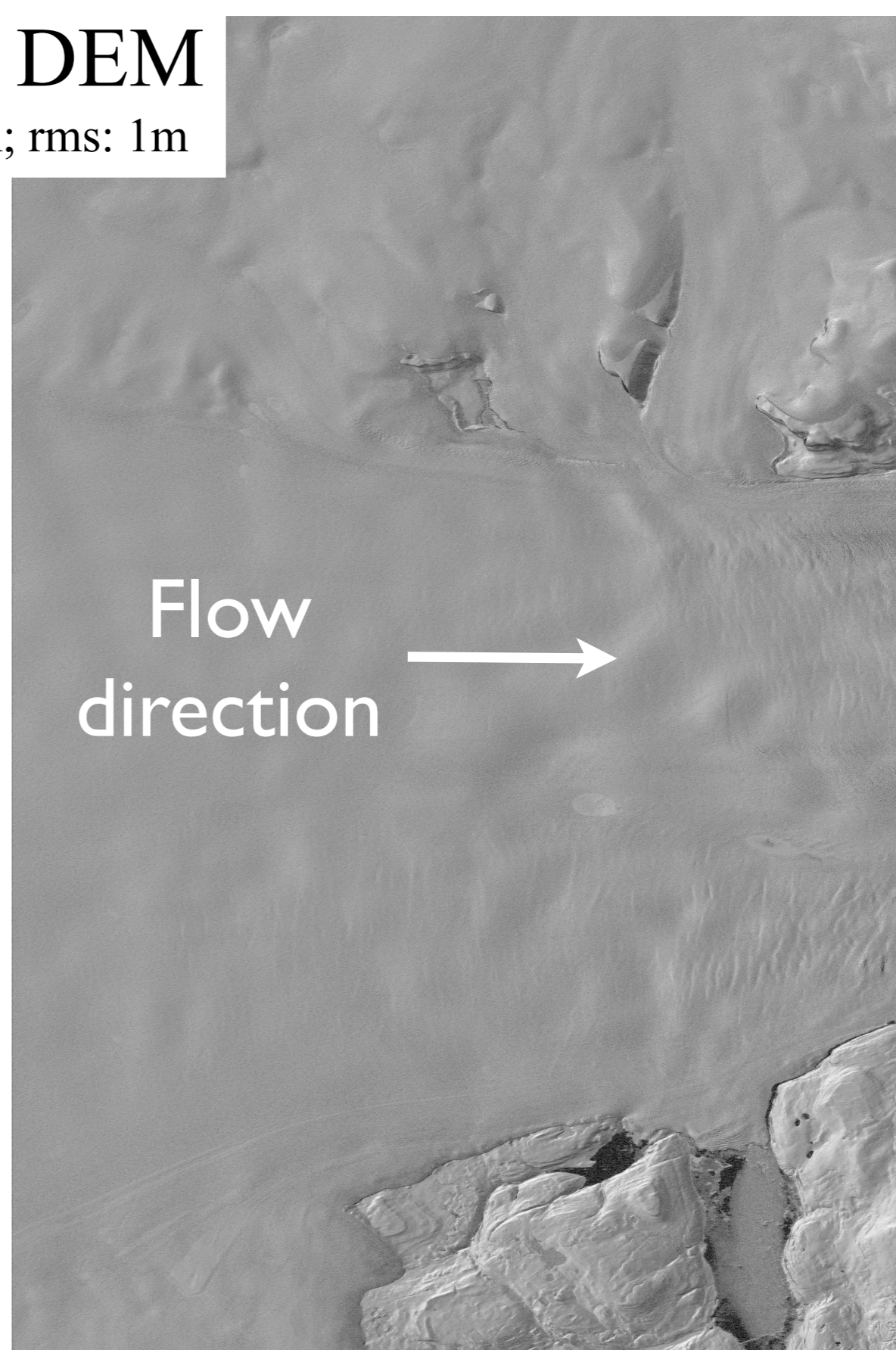
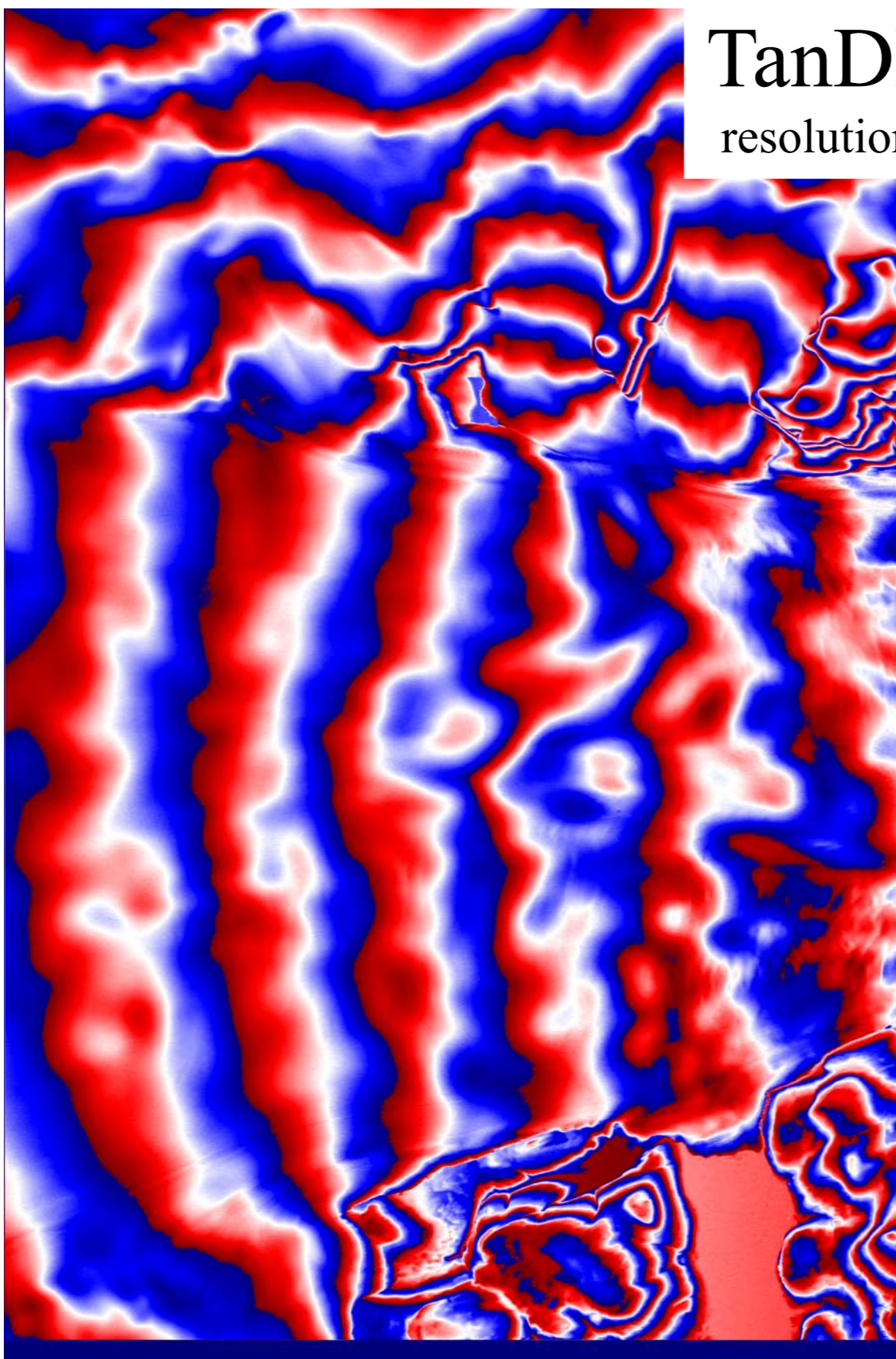


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TanDEM DEM

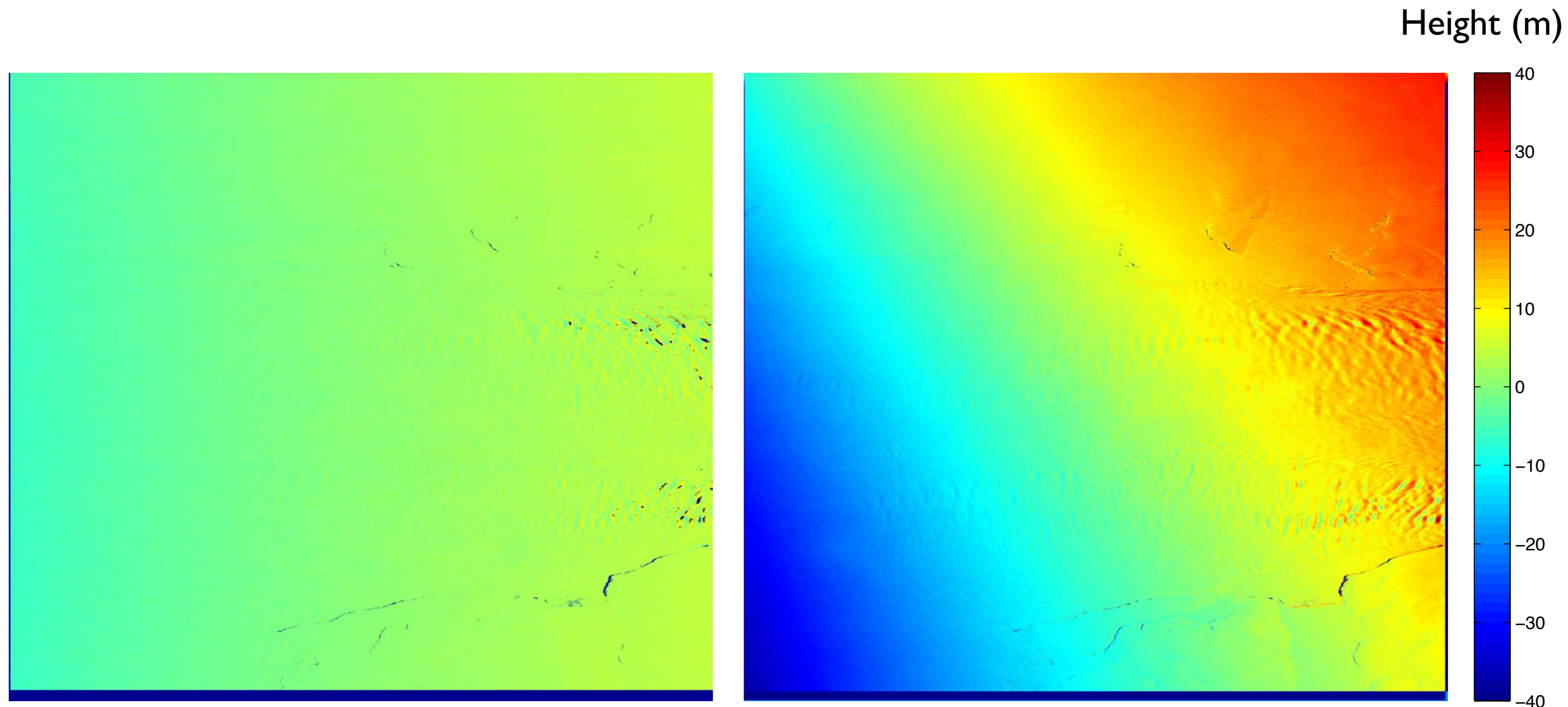
resolution: ~2m; rms: 1m



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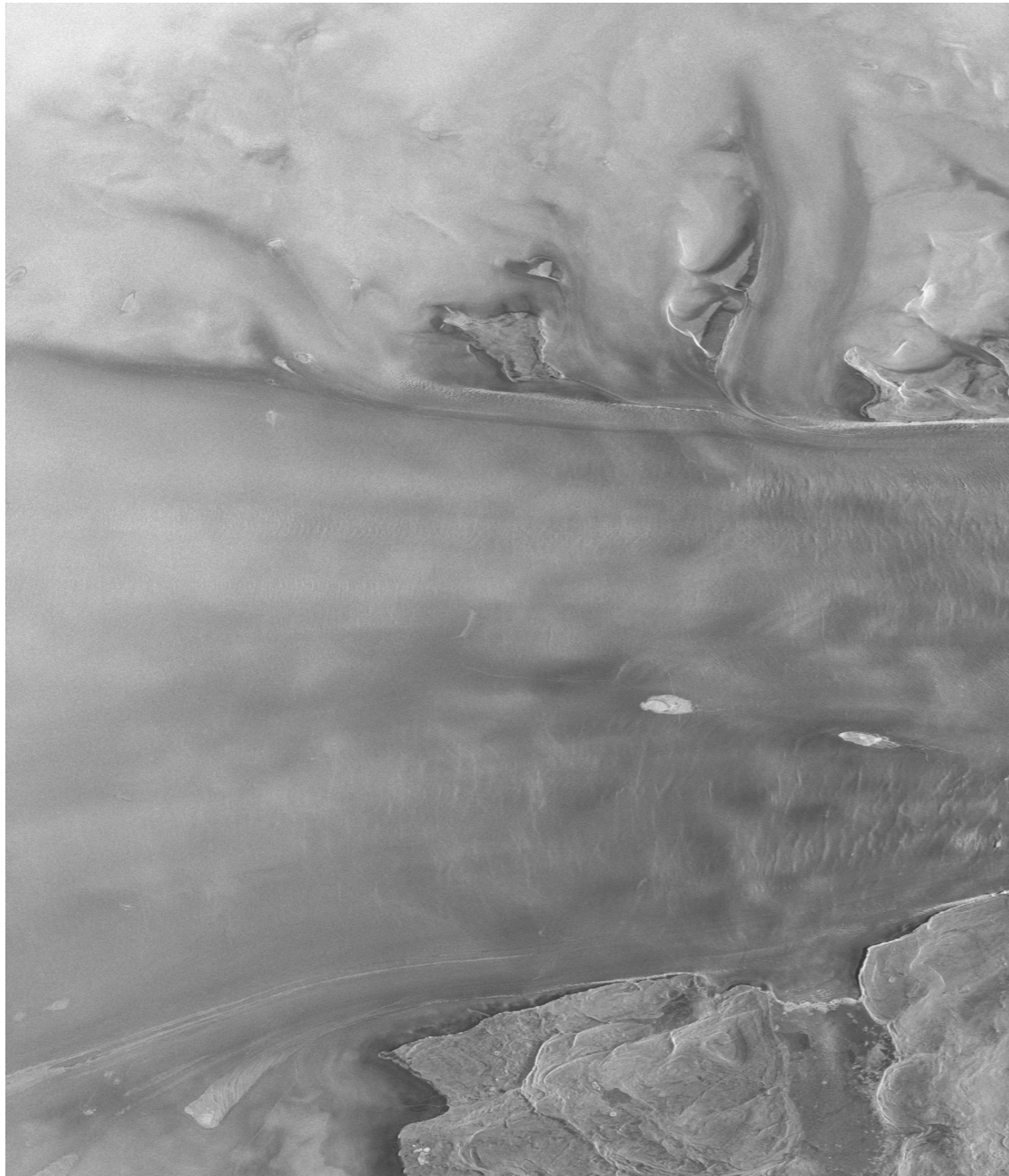


Phase residual of DEM differencing



Correction of residual phase using stable land

Backscatter



Land (blue) - ice (red) mask



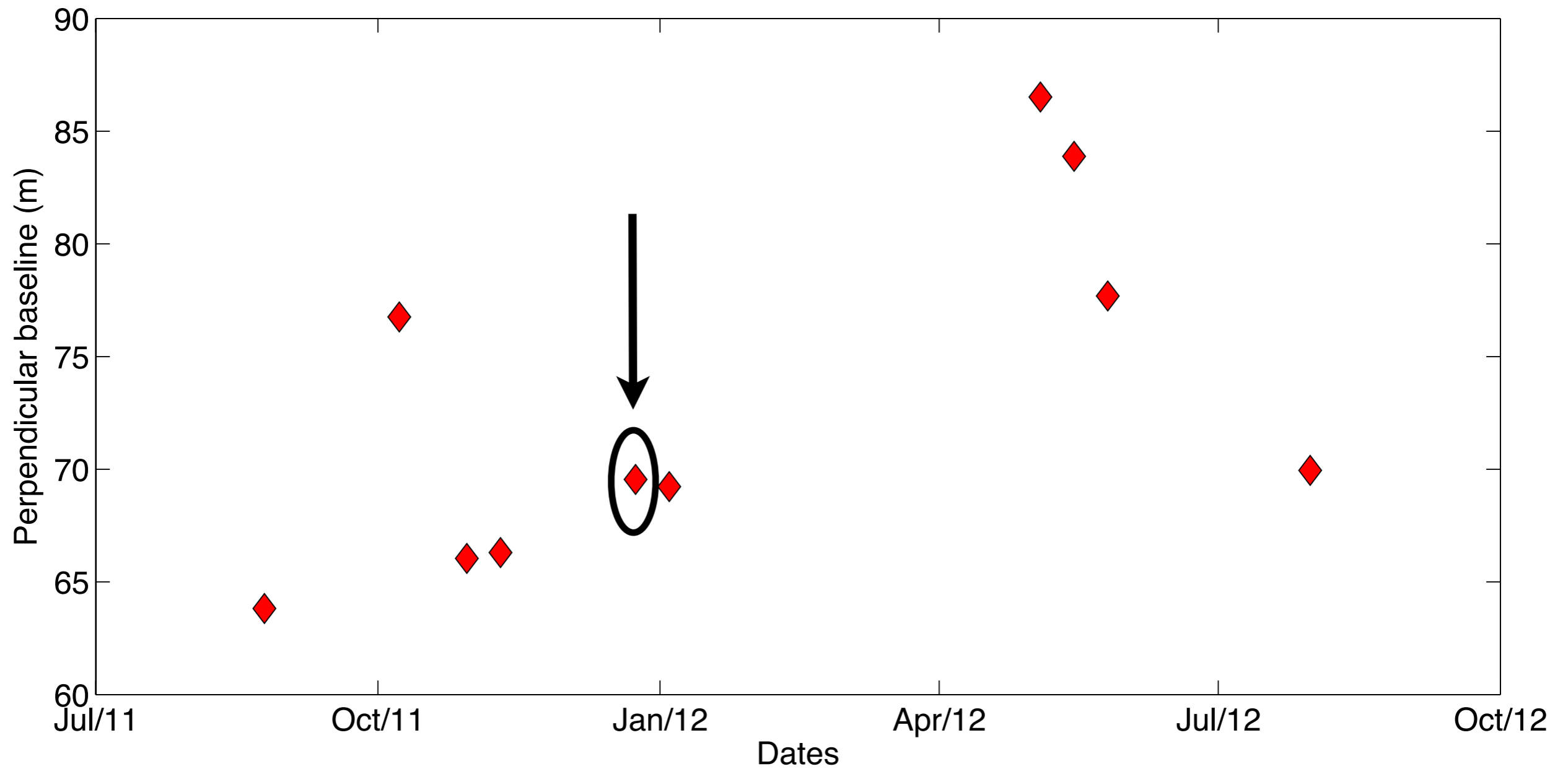
Howat I.M and A. Negrete, 2013



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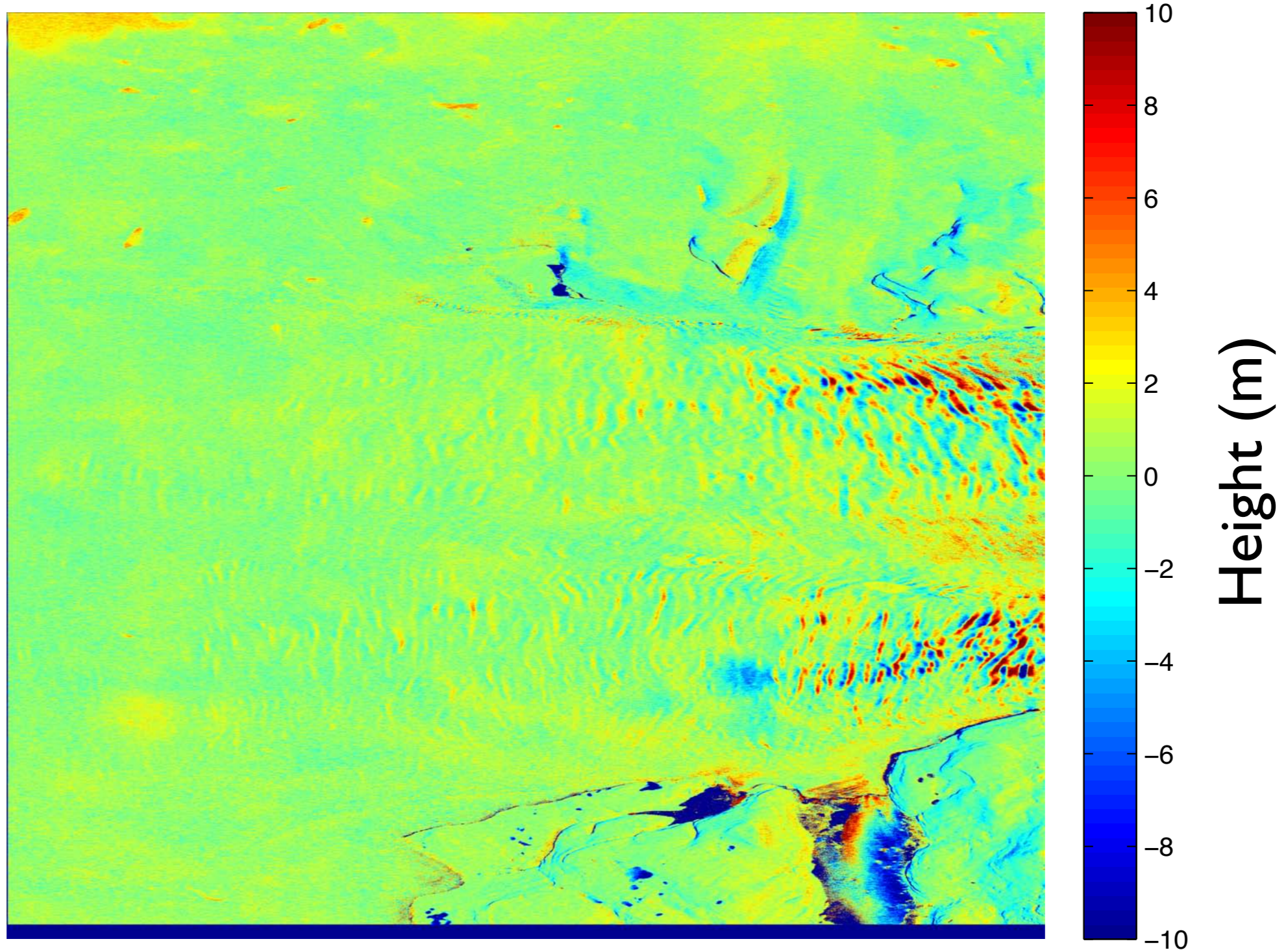
DEM differencing



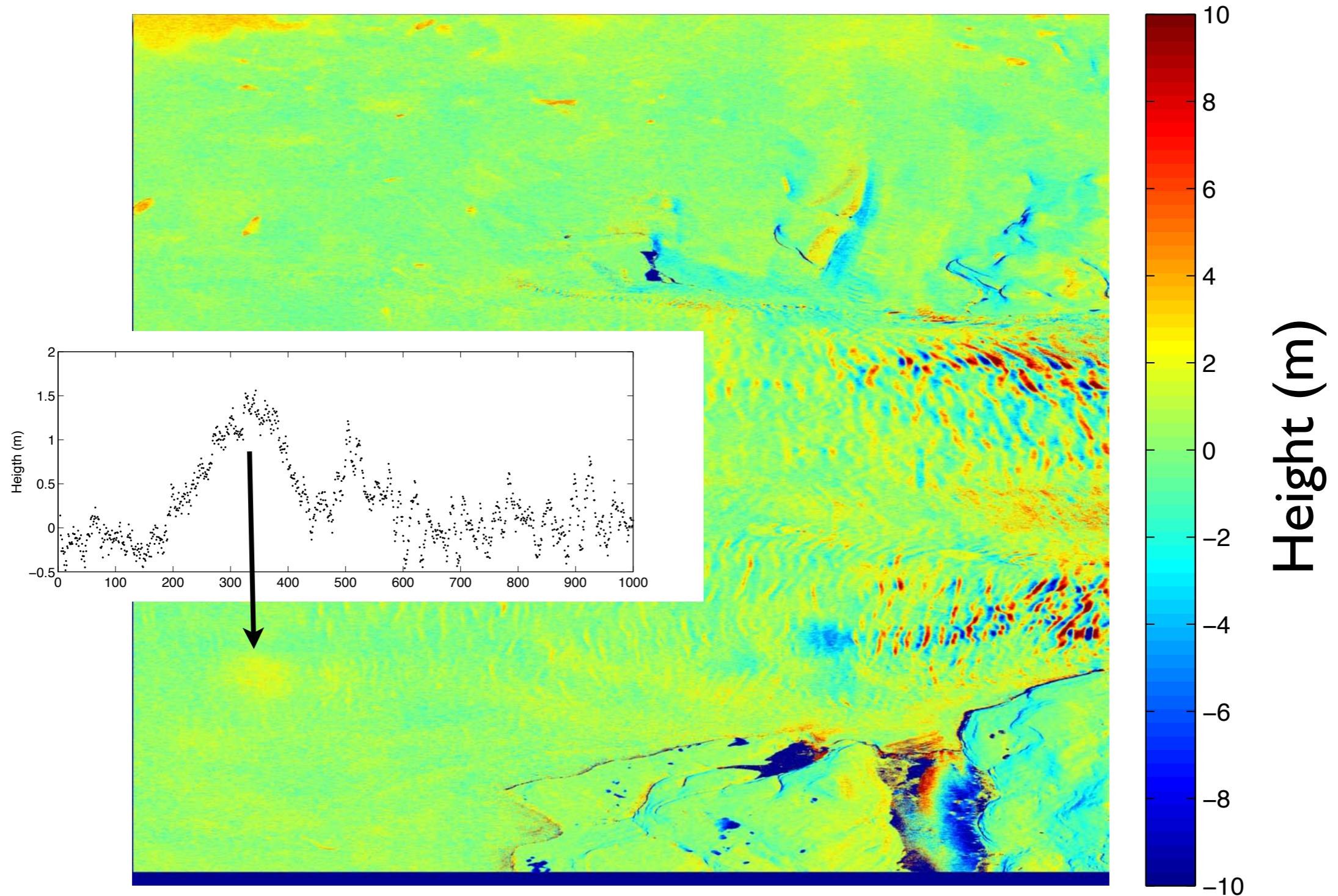
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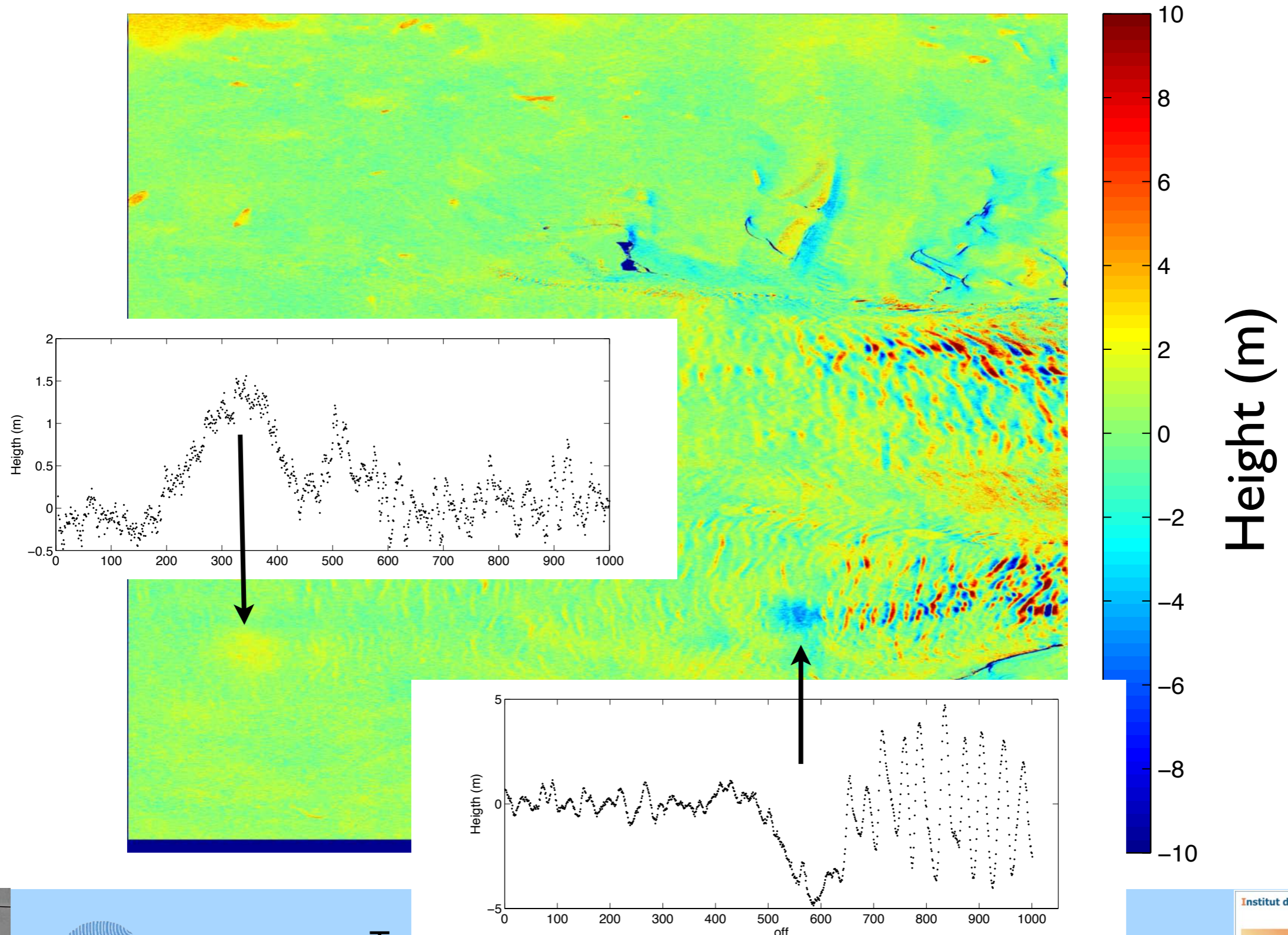
Height difference: 25/08/2011 and 24/12/2011



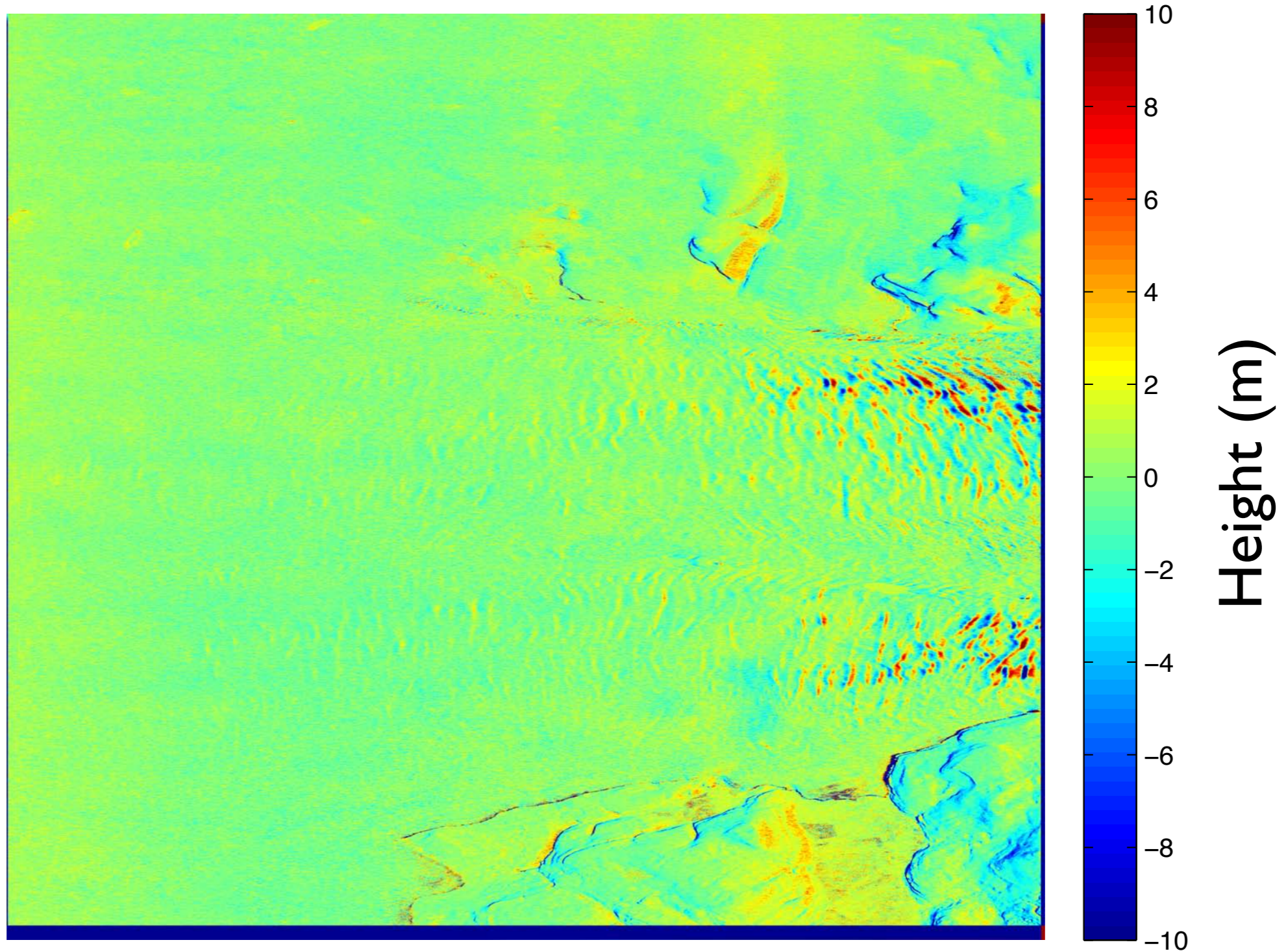
Height difference: 25/08/2011 and 24/12/2011



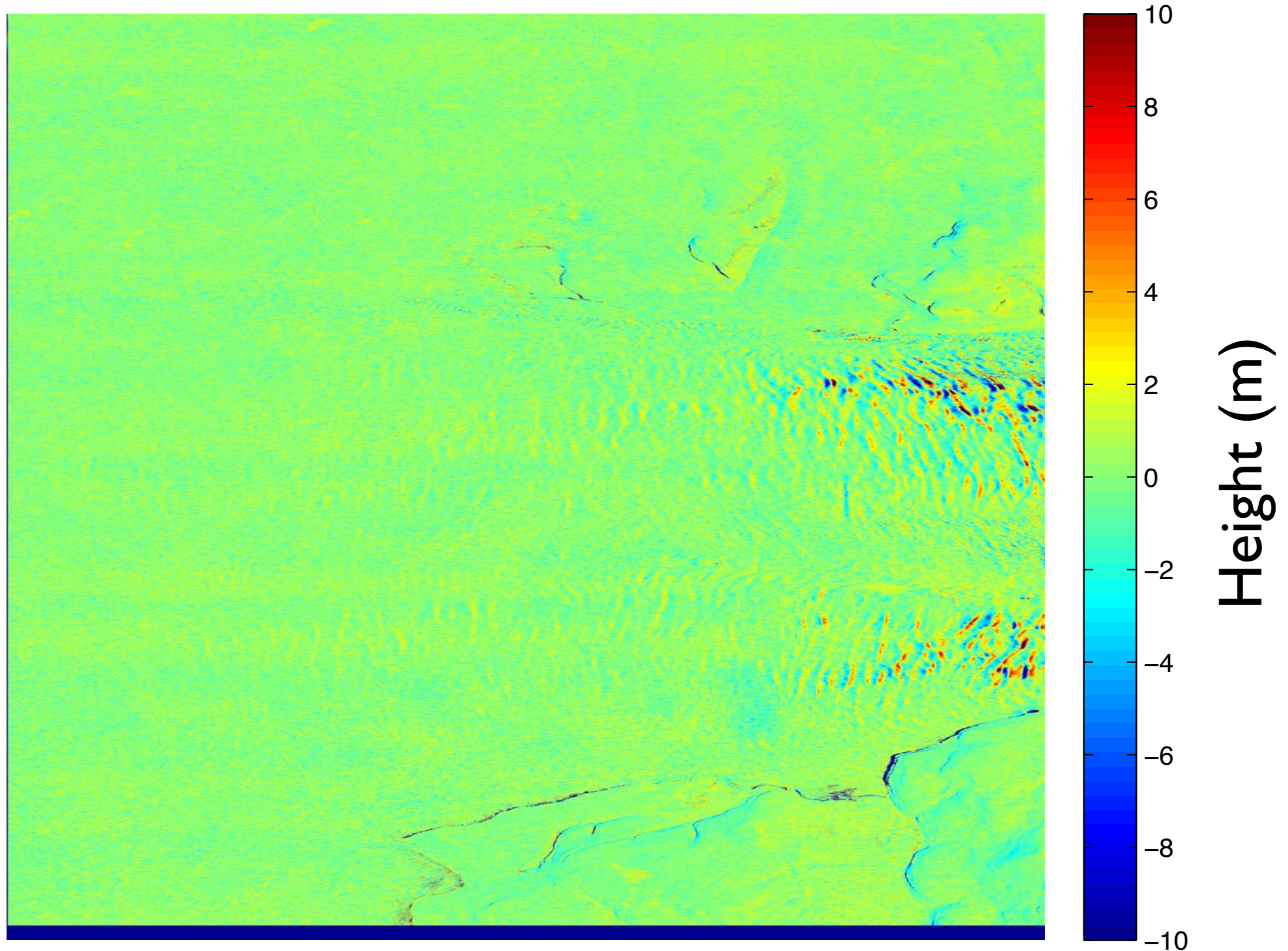
Height difference: 25/08/2011 and 24/12/2011



Height difference: 08/10/2011 and 24/12/2011



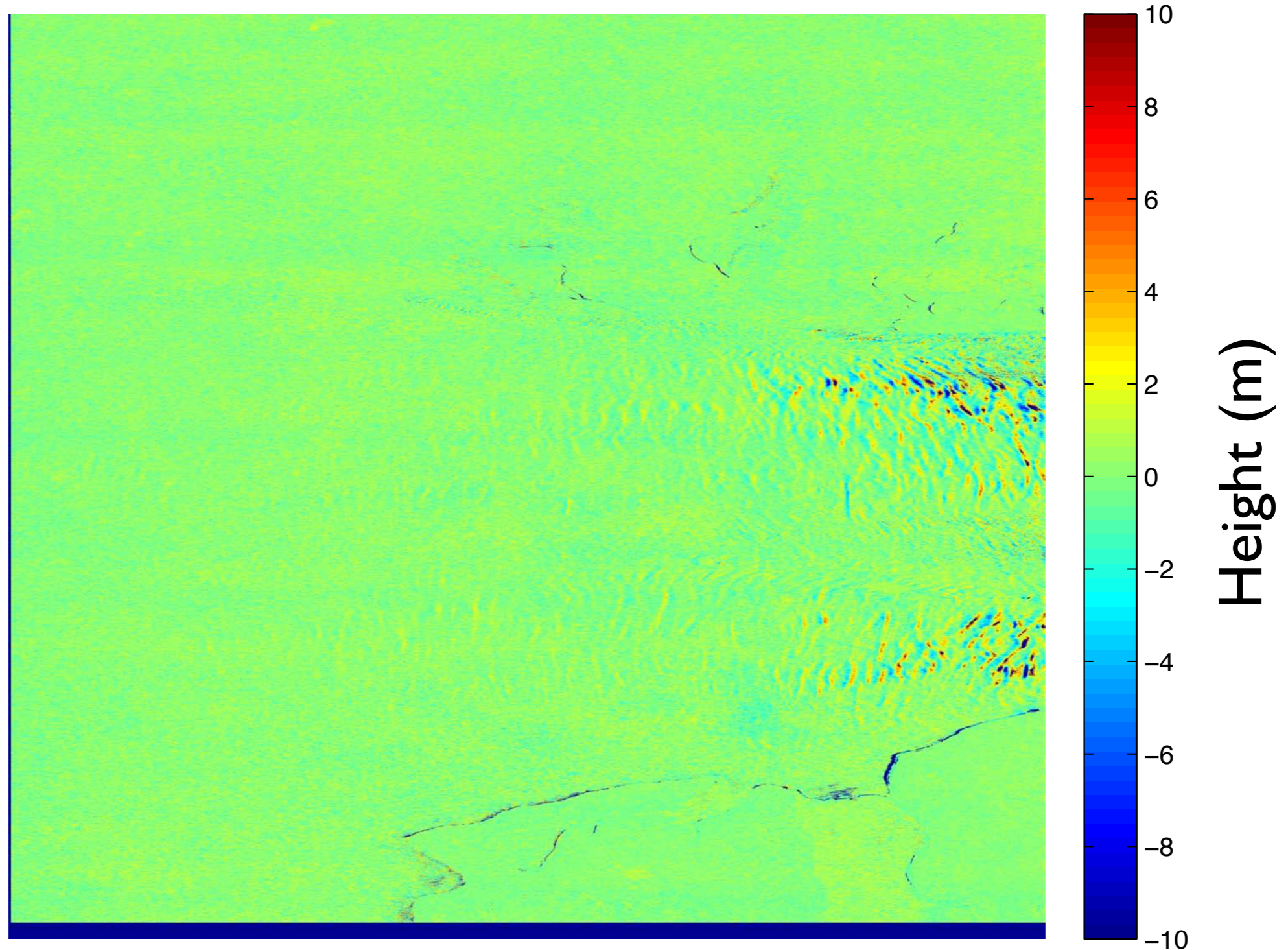
Height difference: 30/10/2011 and 24/12/2011



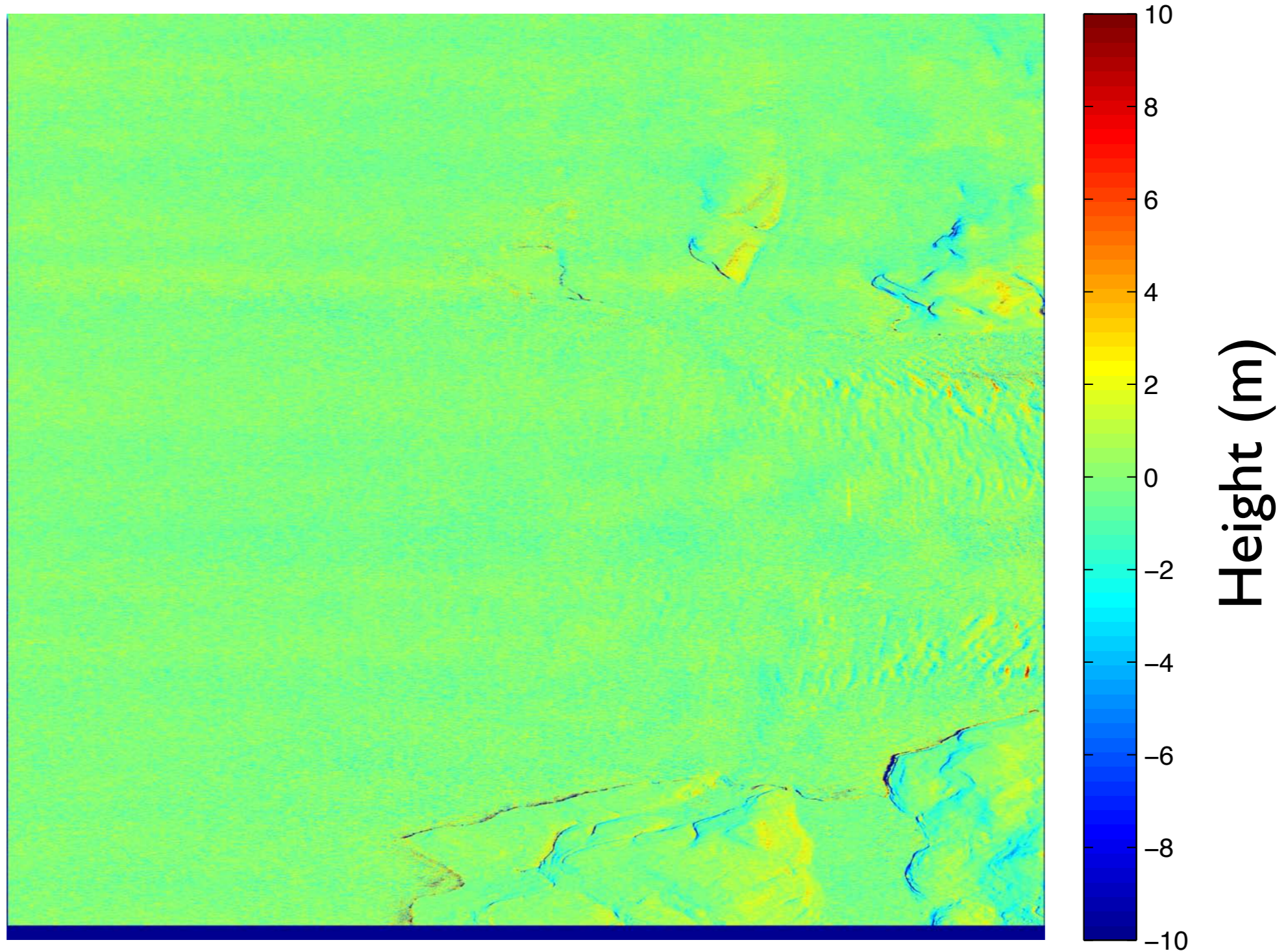
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Height difference: 10/11/2011 and 24/12/2011



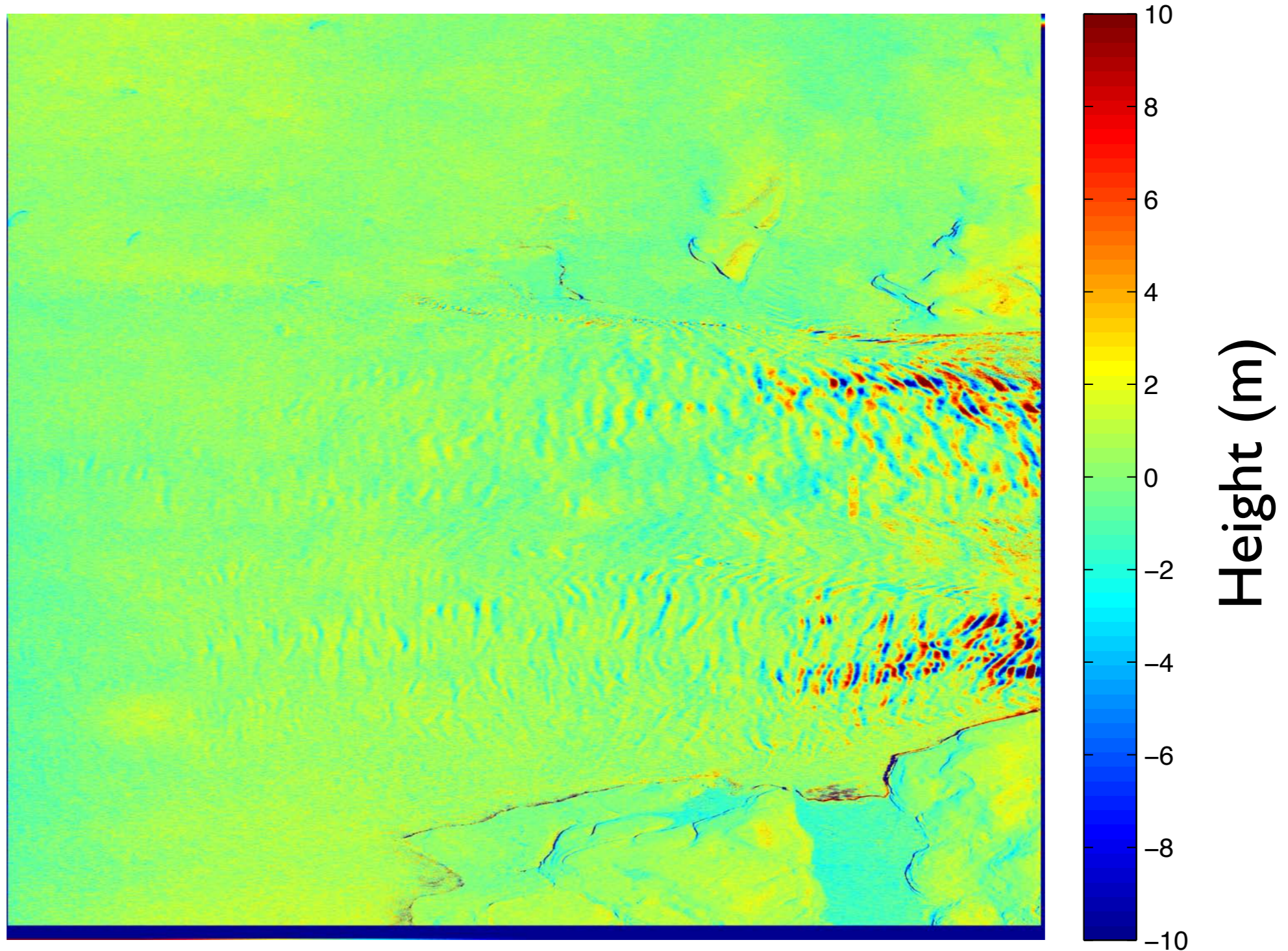
Height difference: 04/01/2012 and 24/12/2011



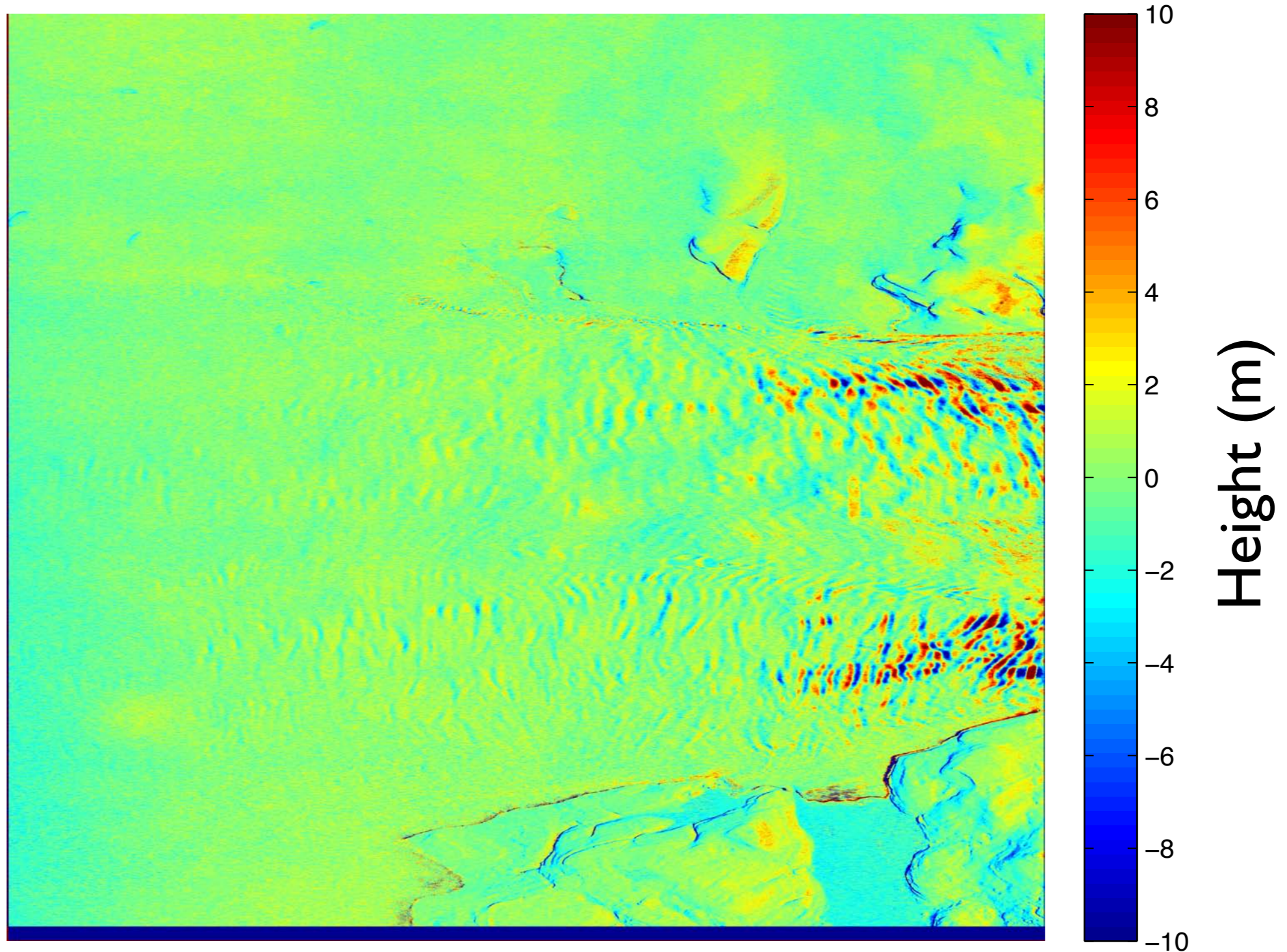
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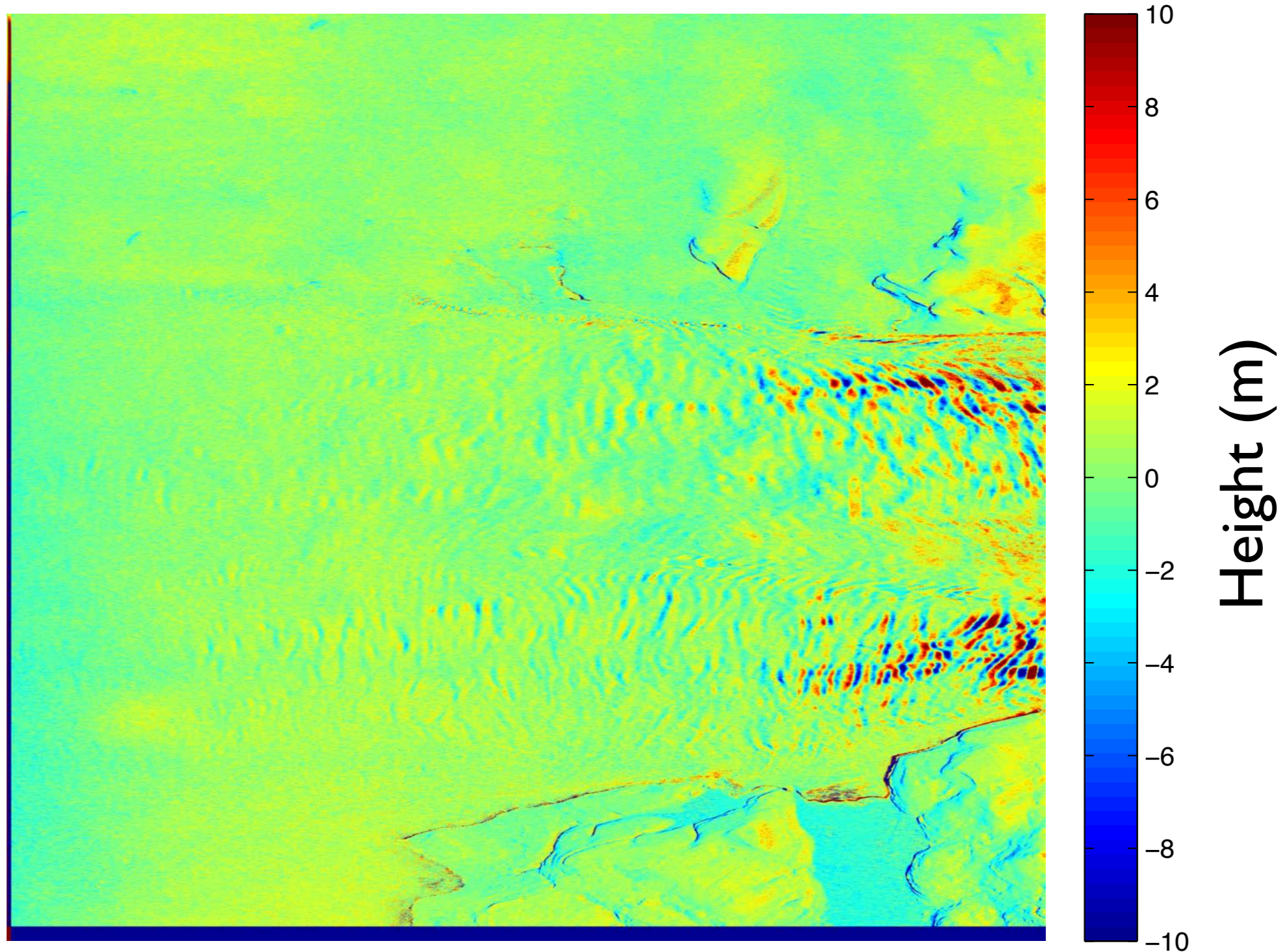
Height difference: 04/05/2011 and 24/12/2011



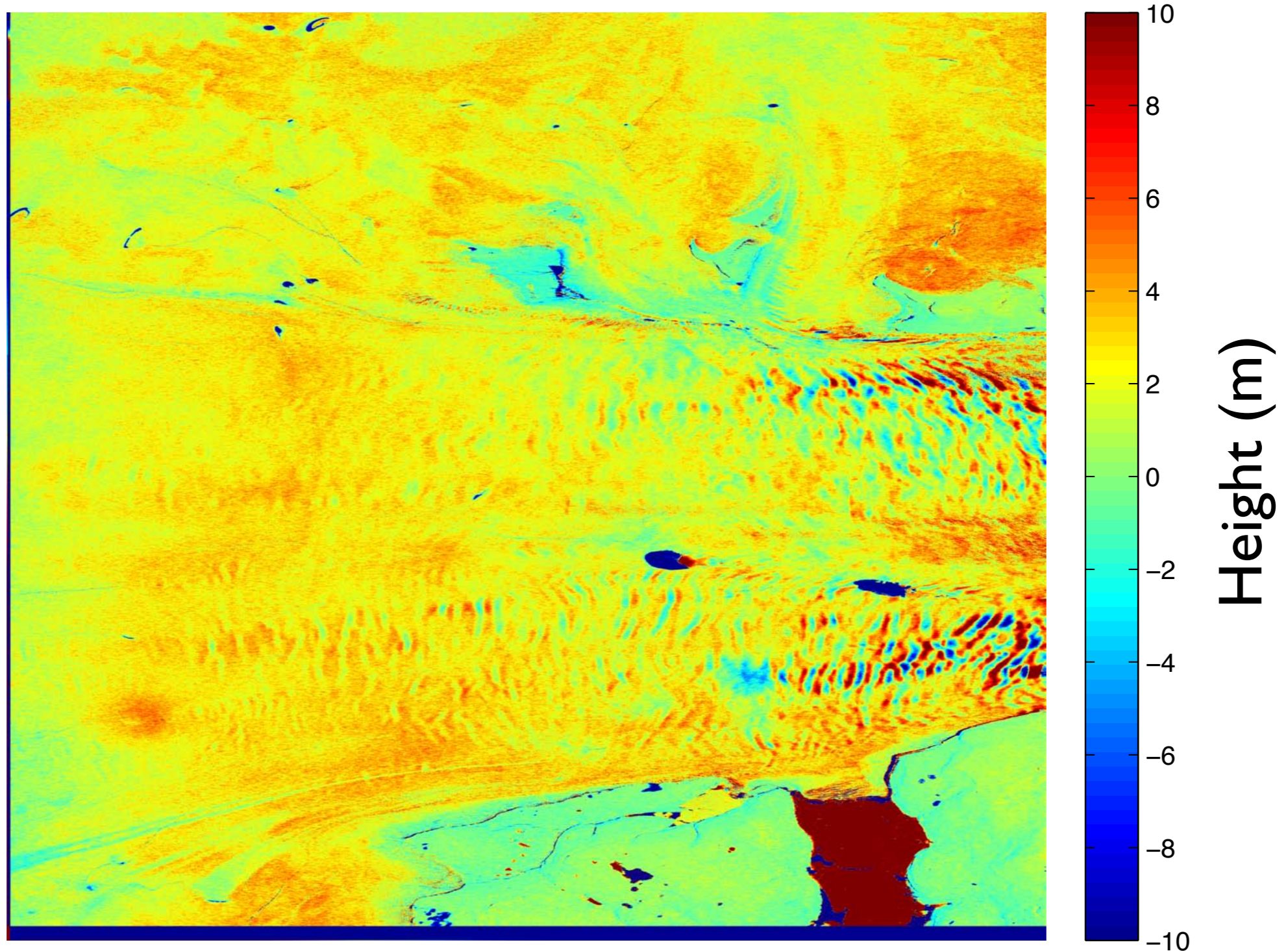
Height difference: 15/05/2011 and 24/12/2011



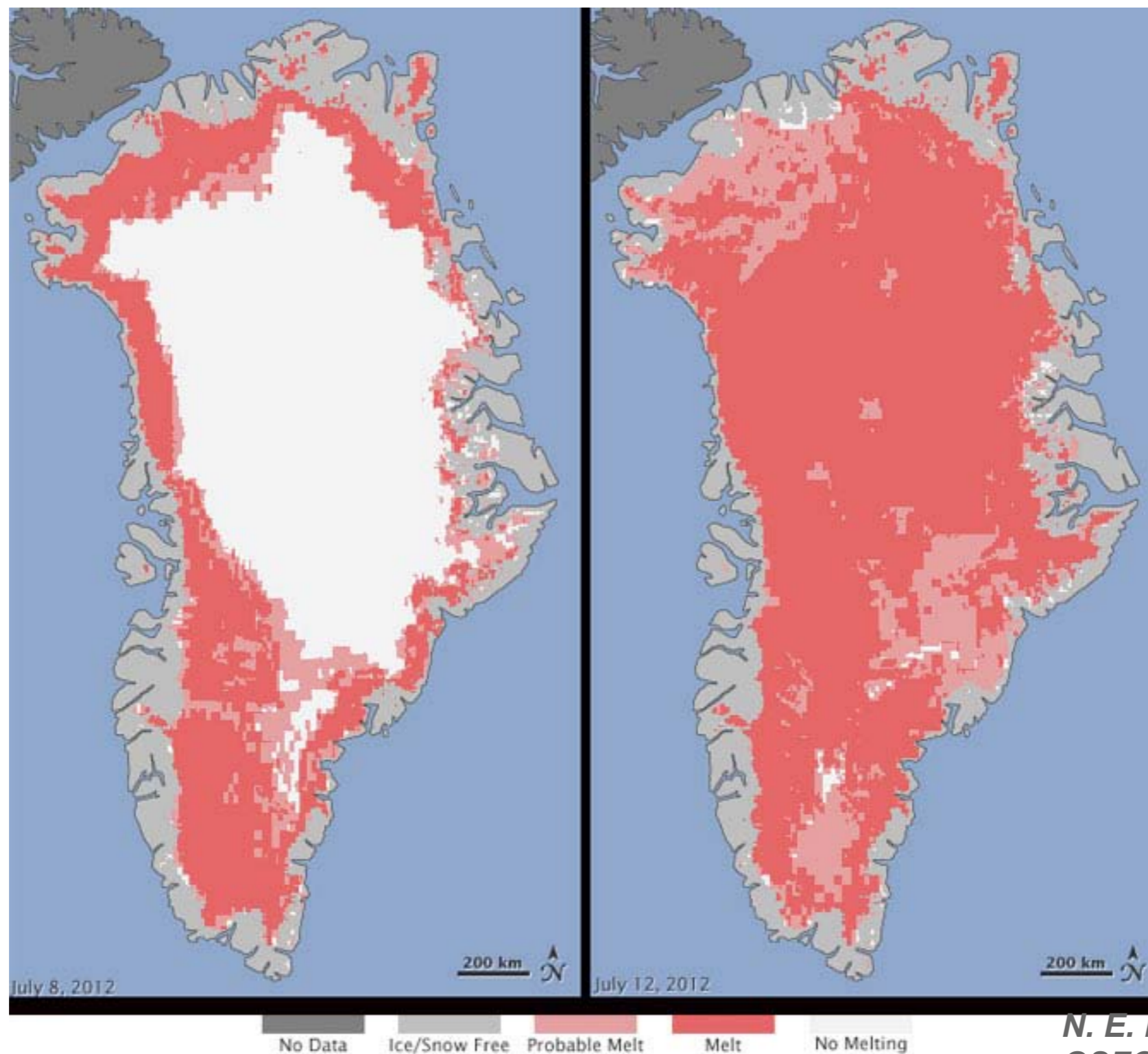
Height difference: 26/05/2012 and 24/12/2011



Height difference: 31/07/2012 and 24/12/2011



2012 Greenland surface melt event



N. E. DiGirolamo, SSAI/NASA
GSFC, J. Allen, NASA Earth

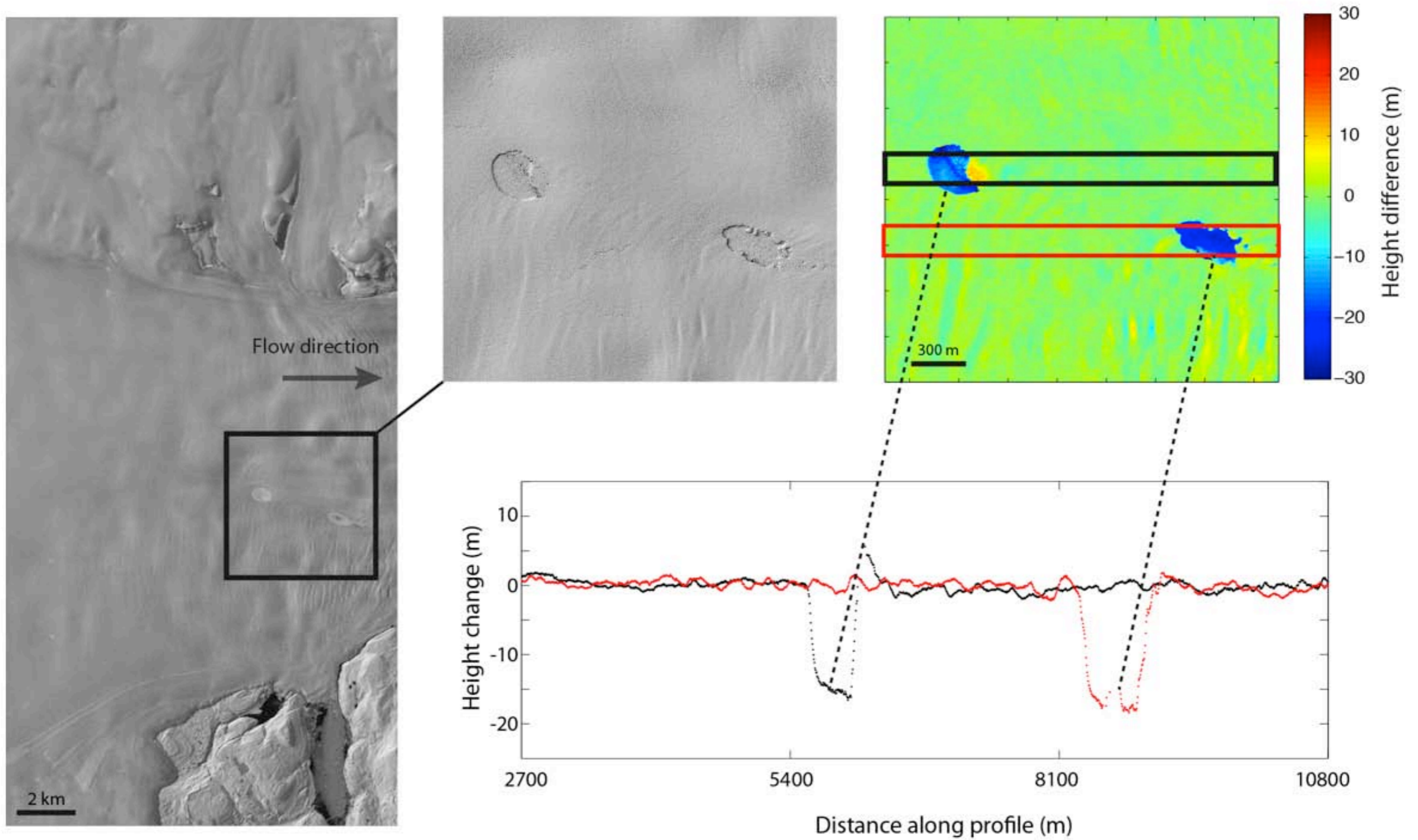
Institut de Physique du Globe de Strasbourg



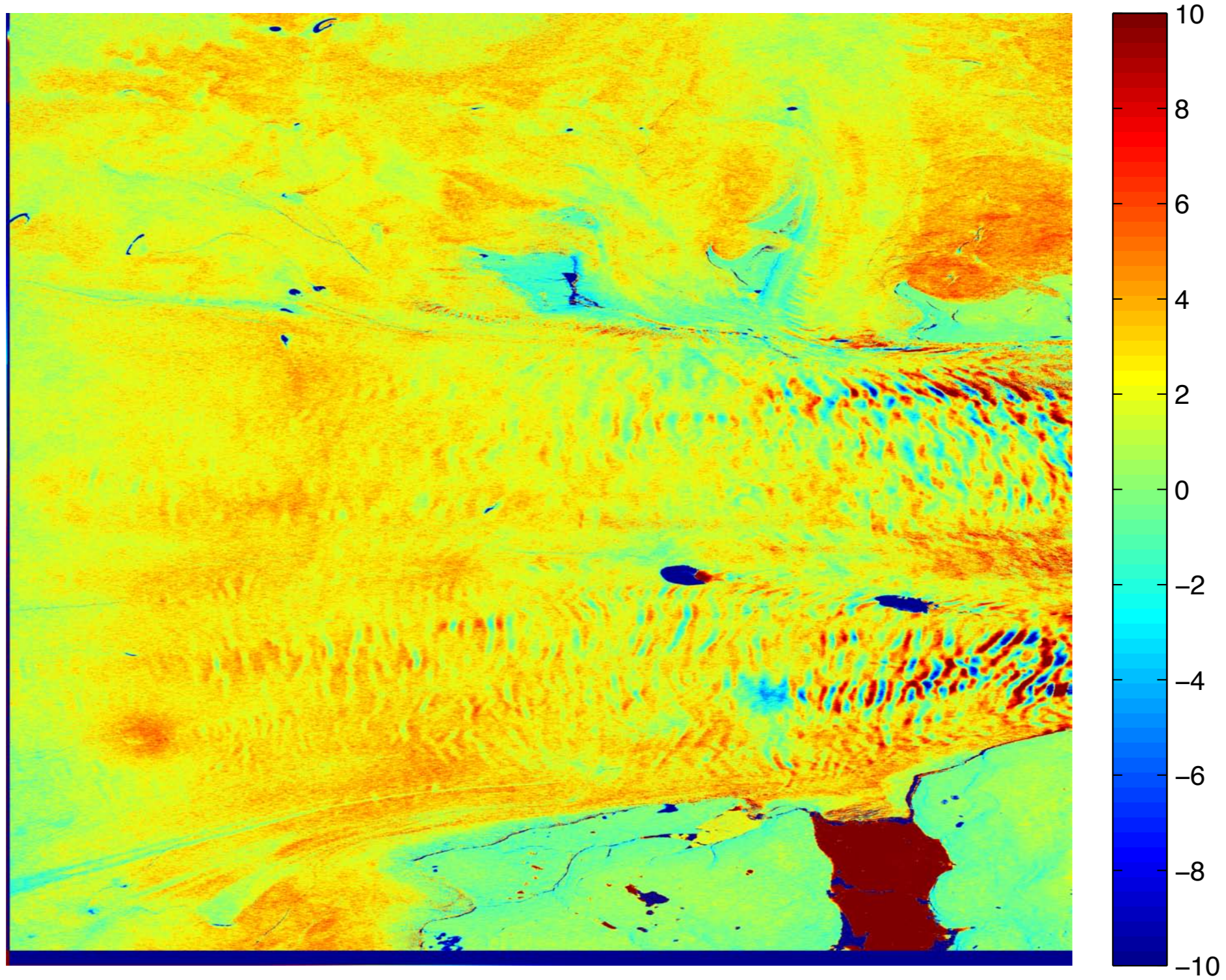
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Supraglacial lake



Ice/Snow penetration



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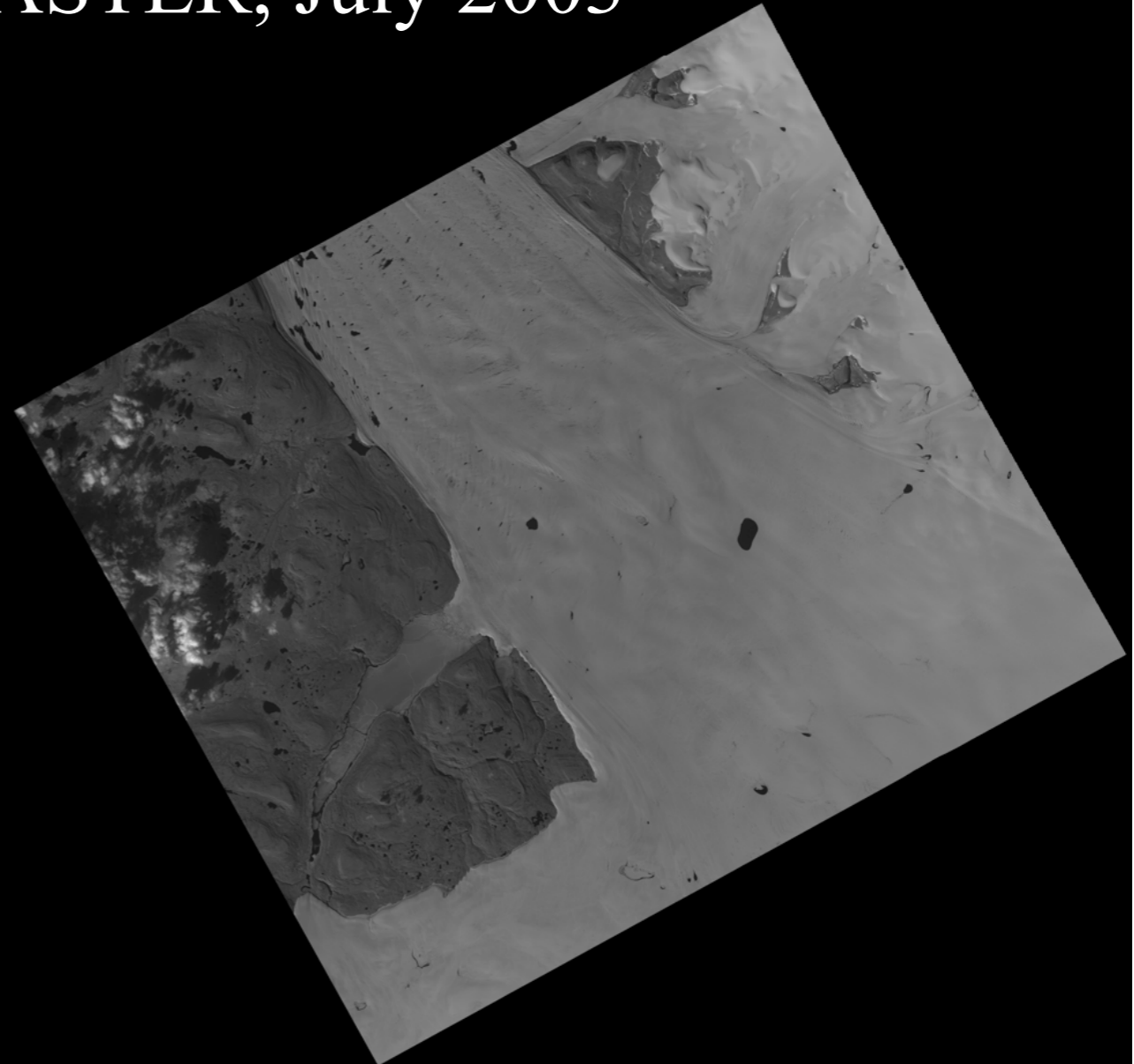
Long-term height change

TanDEM-X (2012)

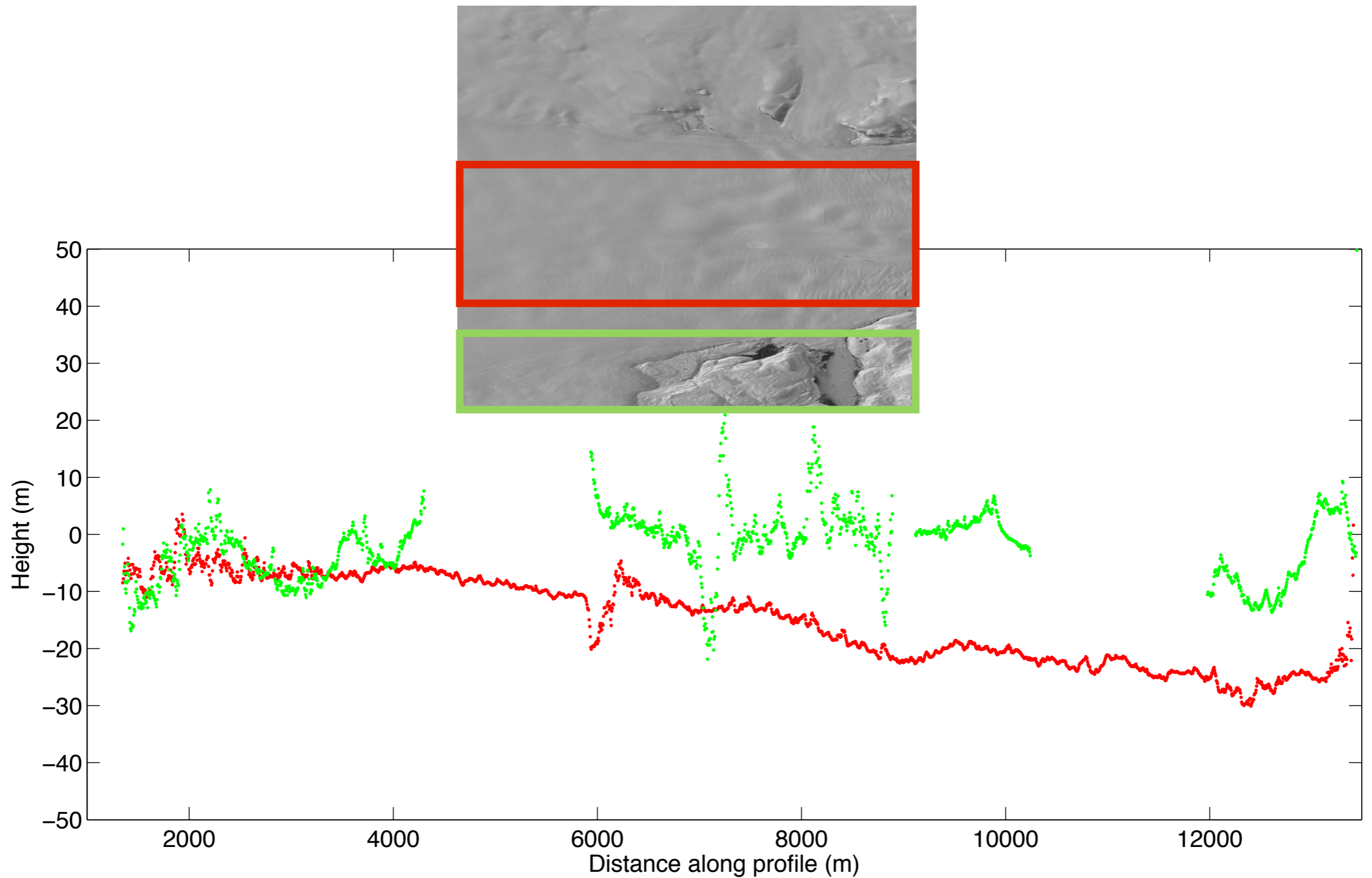
minus

ASTER dem (2003)

ASTER, July 2003



Long-term height change



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Conclusions

- Time series of TanDEM-X dems show dynamic scattering height
- Detection and quantification of dynamic of plumbing system at Petermann Gletscher
- Long-term thinning of Peterman Gletscher



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