



EGRIP Steering  
Committee 2018

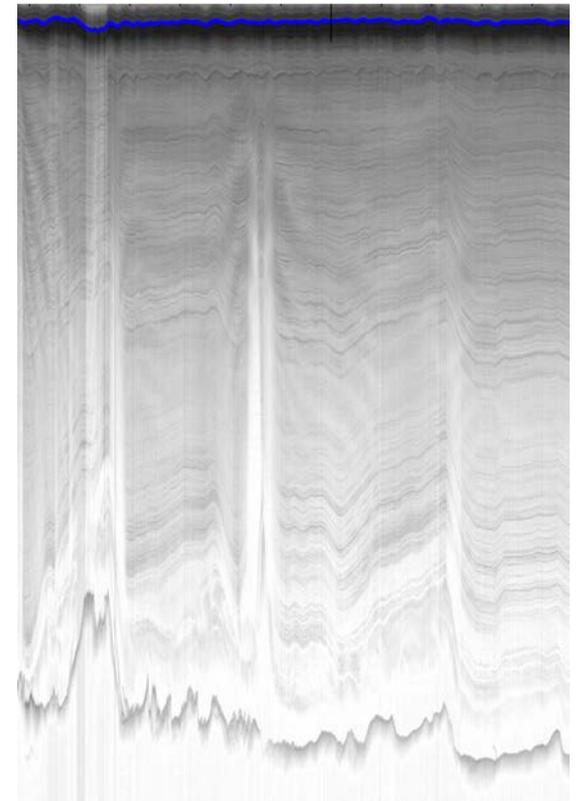
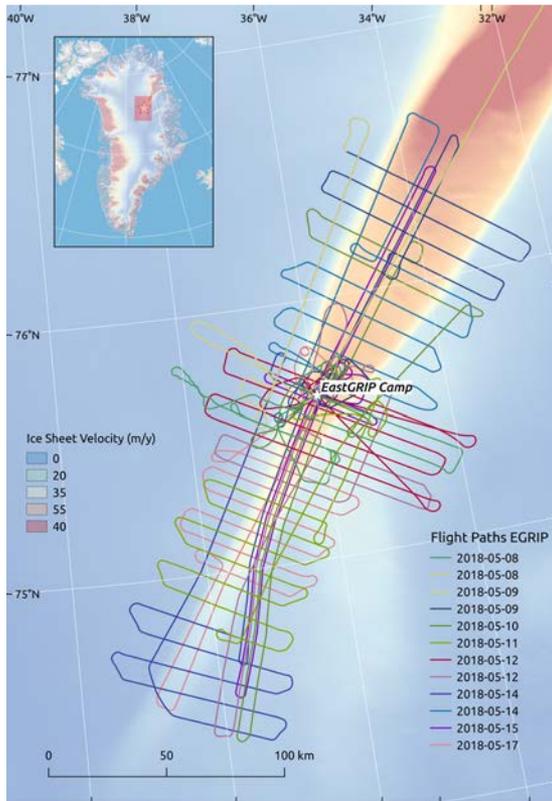
## First results of the AWI-Polar 6 airborne radio echo sounding survey around EGRIP drill site



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<sup>2</sup>Center for Remote Sensing of Ice Sheets, University of Kansas



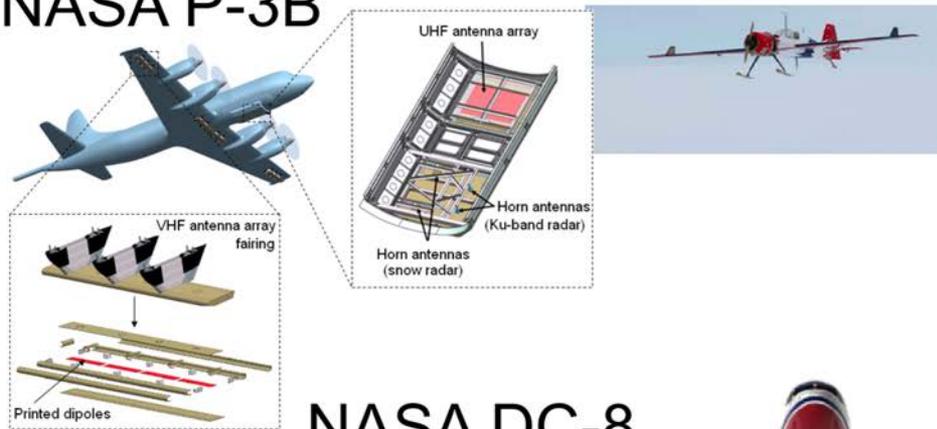
## AWI UWB Radar Sounding at EastGRIP

# Overview

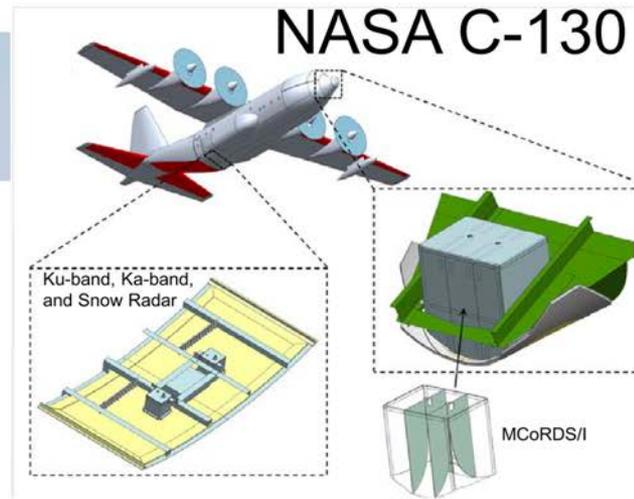
- Airborne radar data acquisition survey in May 2018 with Polar6
- Survey covers an area of 16.000 km<sup>2</sup> | 7700 km of profiles (12 TB data)
- Parallel and orthogonal to ice flow (ice stream and beyond shear margin)
- Full SAR processing of most of the data

## Multichannel Coherent Radar Depth Sounder (MCoRDS)

### NASA P-3B



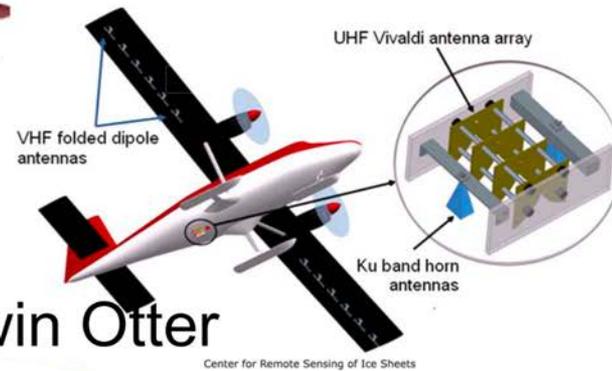
### NASA C-130



### NASA DC-8



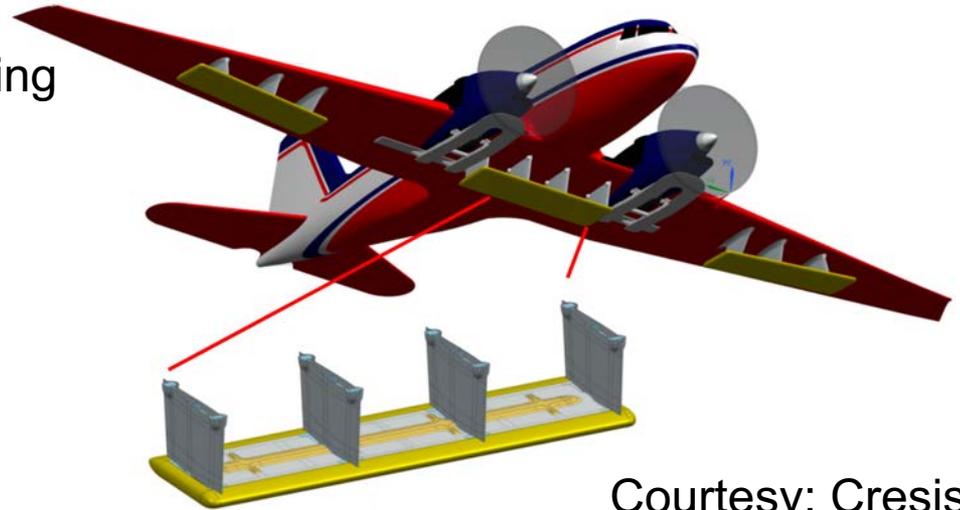
### Basler



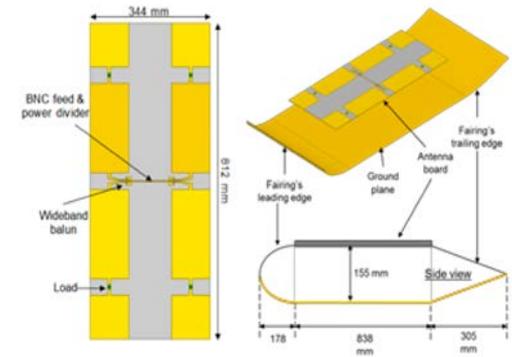
# AWI-UWB Radar System | AWI-UWB



- Measure ice thickness, internal layering and image bed properties
- Power: up to 4kW
- Frequency Range: 150-600 MHz
- Slotted Arras Systems for Wings and Fuselage (8 – 24)

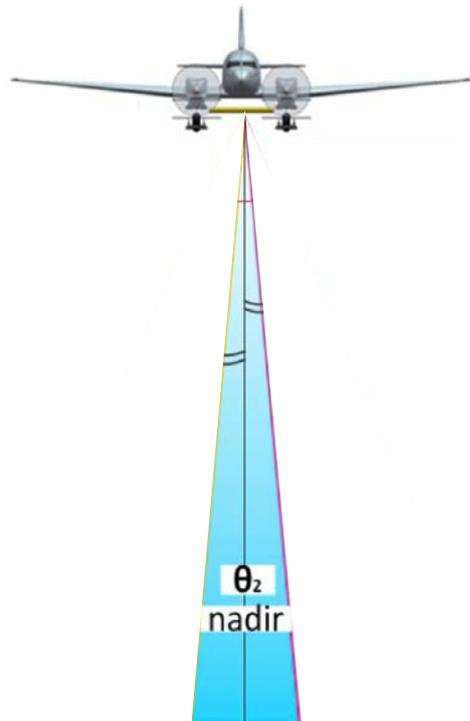


Courtesy: Cresis



## Transmission Parameters:

- pulse length
- intensity
- transmission angle
- sending / receiving channels
- 2D (nadir)

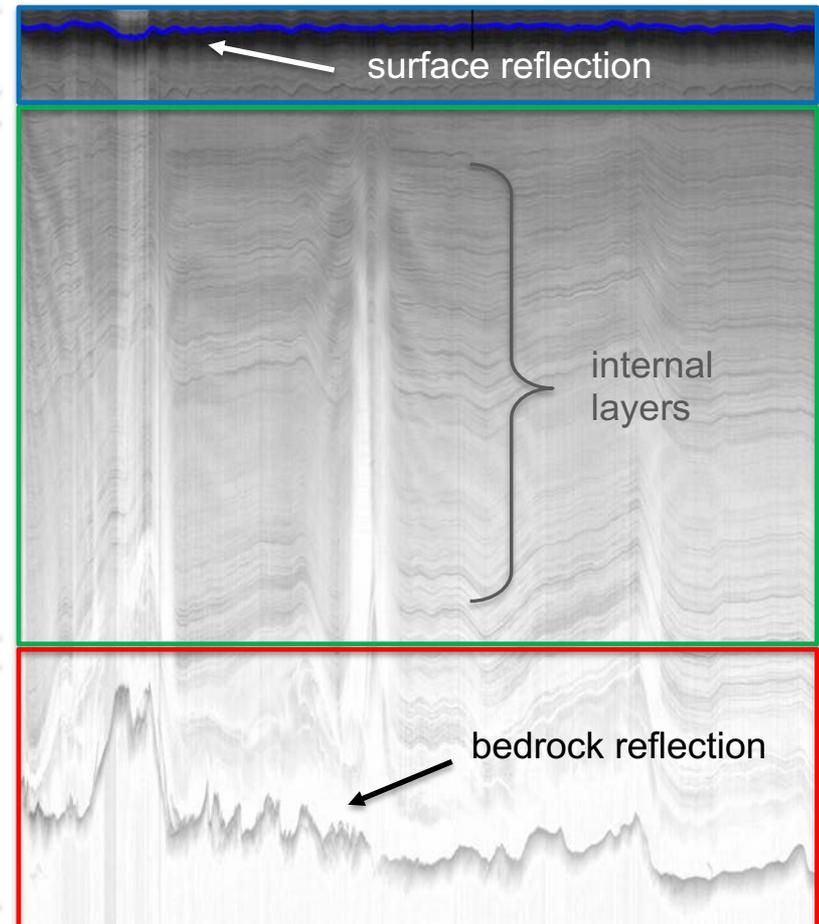


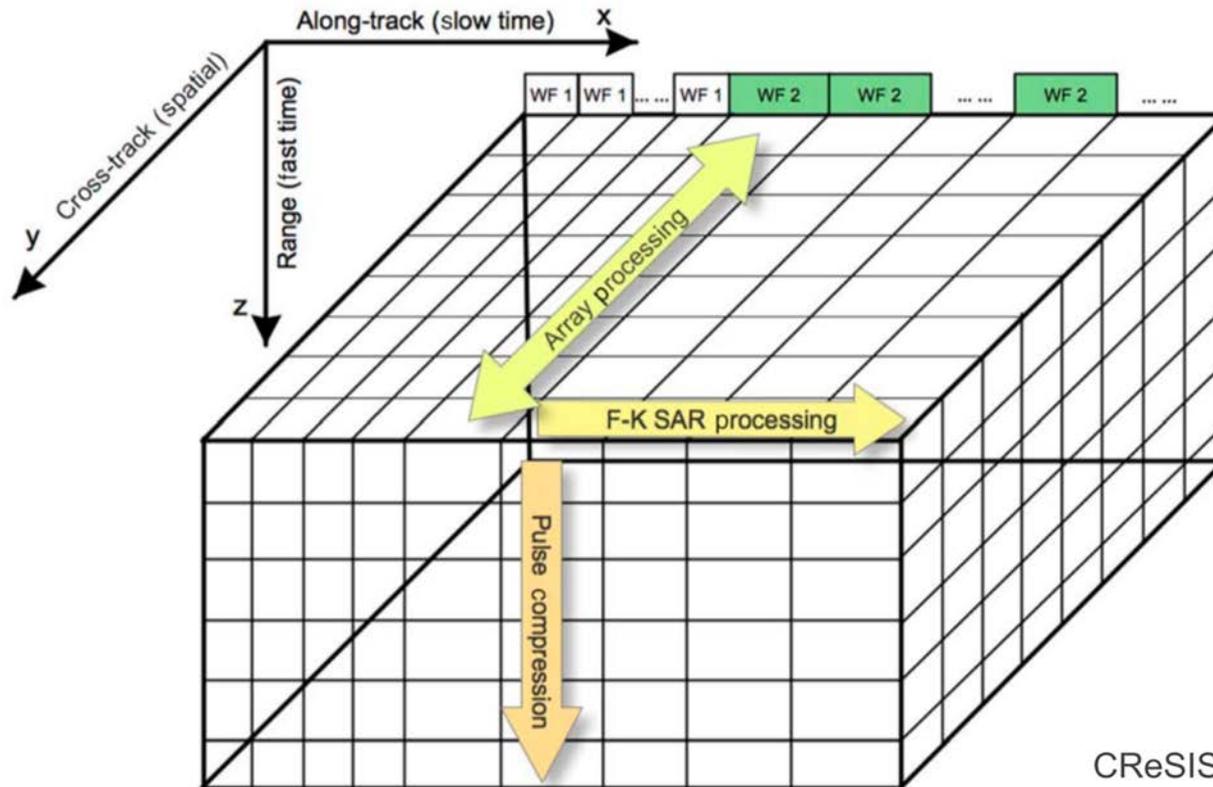
1 $\mu$ s chirp, nadir, 1/37  
reduced intensity for  
reflectors close to  
surface

3 $\mu$ s chirp, nadir,  
full intensity,  
reflectors < 2500 m

10 $\mu$ s chirp, nadir,  
full intensity,  
reflectors < 4000 m

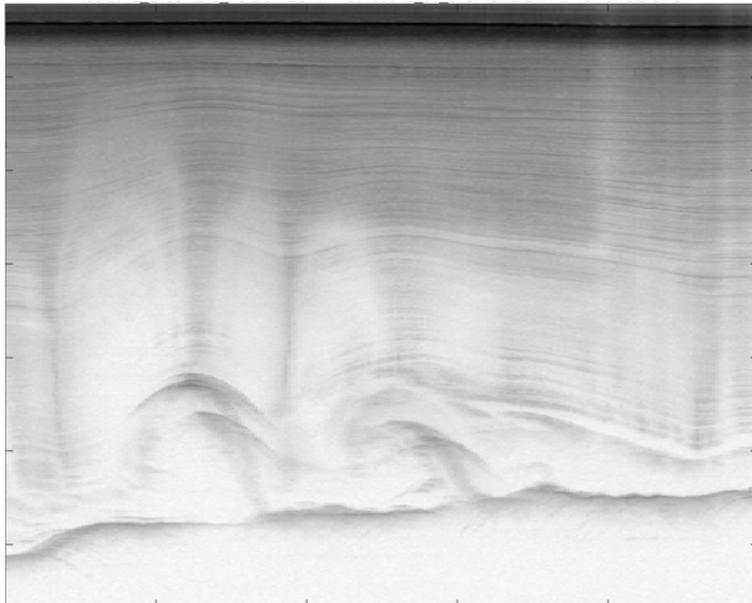
## Example: 2D Sounding Mode





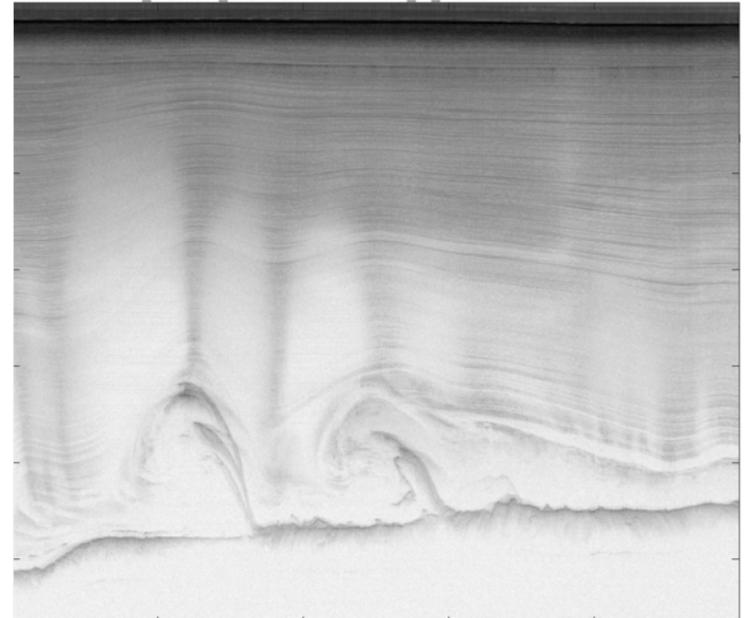
## quick-look output

- channels are averaged coherently
- assumption: rreturn signal all nadir
- output is used to find the ice surface location

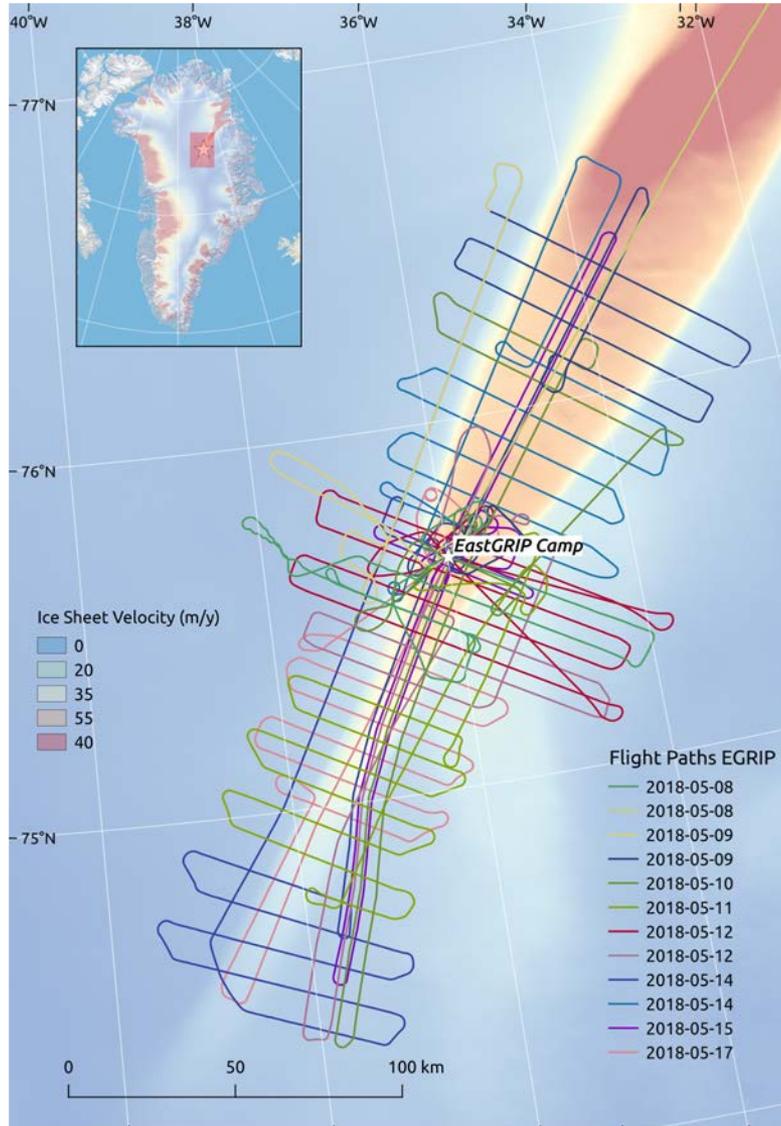


## SAR output

- SAR processing with along-track spatial frequency window using f-k
- migrationchannels are averaged together coherently



# Radar Survey May 2018



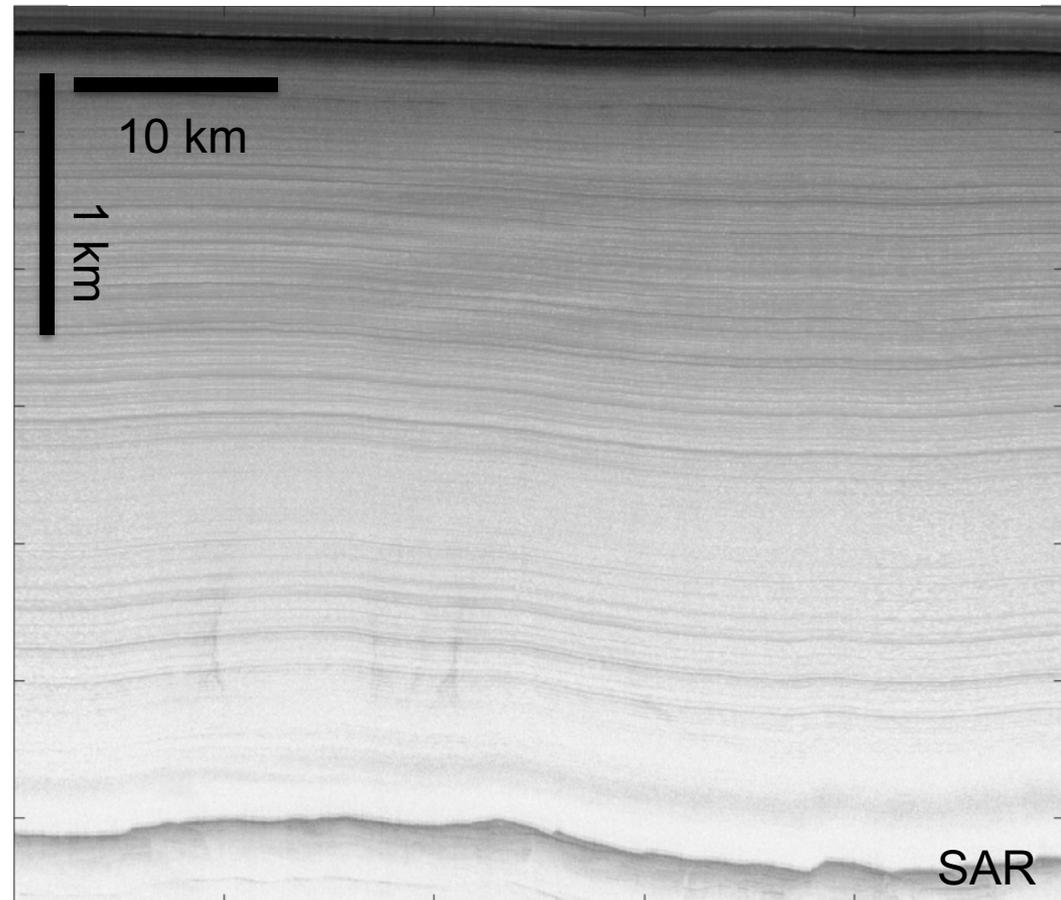
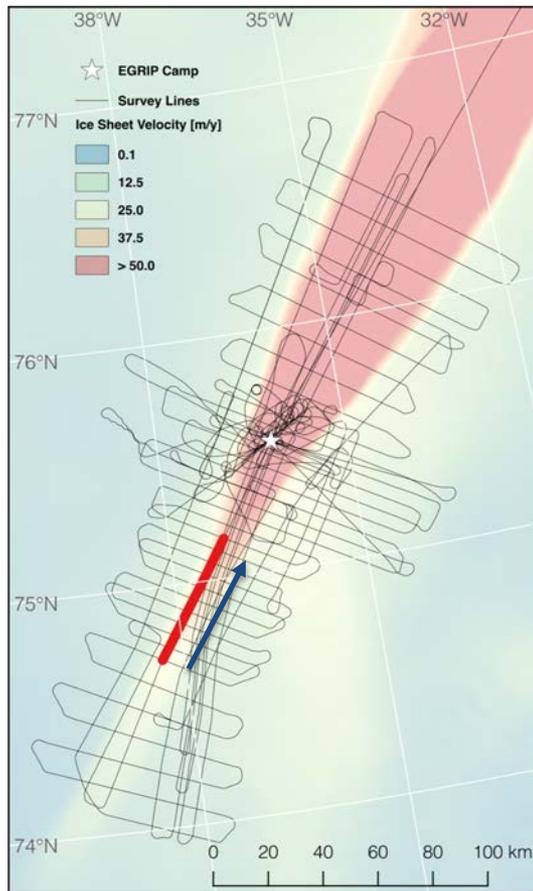
## Configuration:

- Array elements: 8
- Bandwidth: 180 - 210 MHz
- Flight days: 8

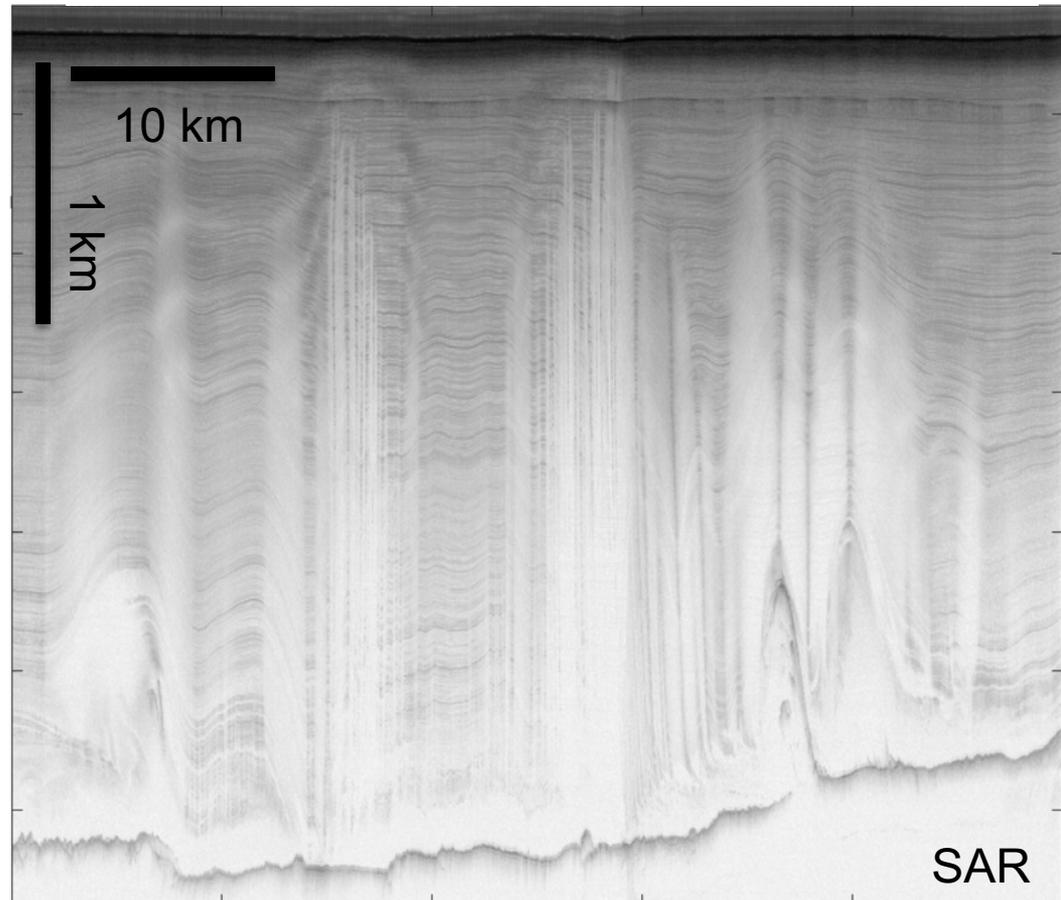
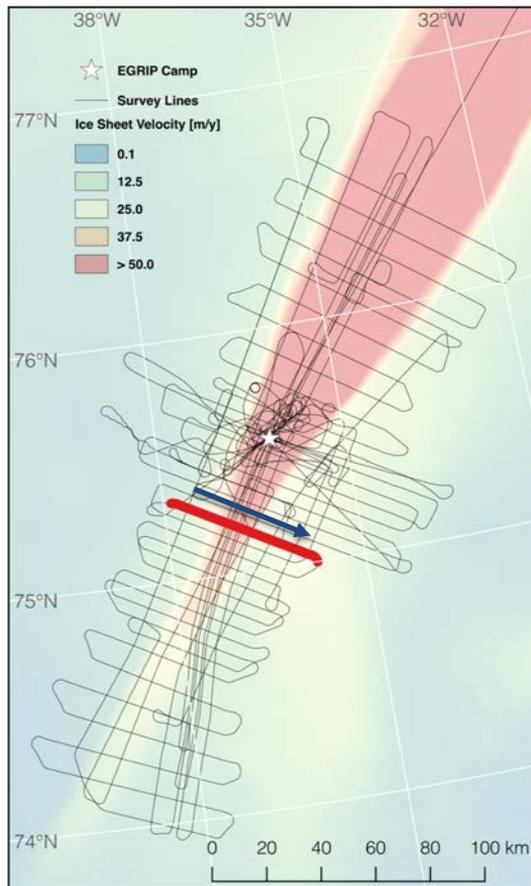
## Scientific questions:

- How does a strong velocity gradient influence the layering and the shear margin?
- How did the ice that is being drilled right now evolve along the flow line?
- Bedrock in detail

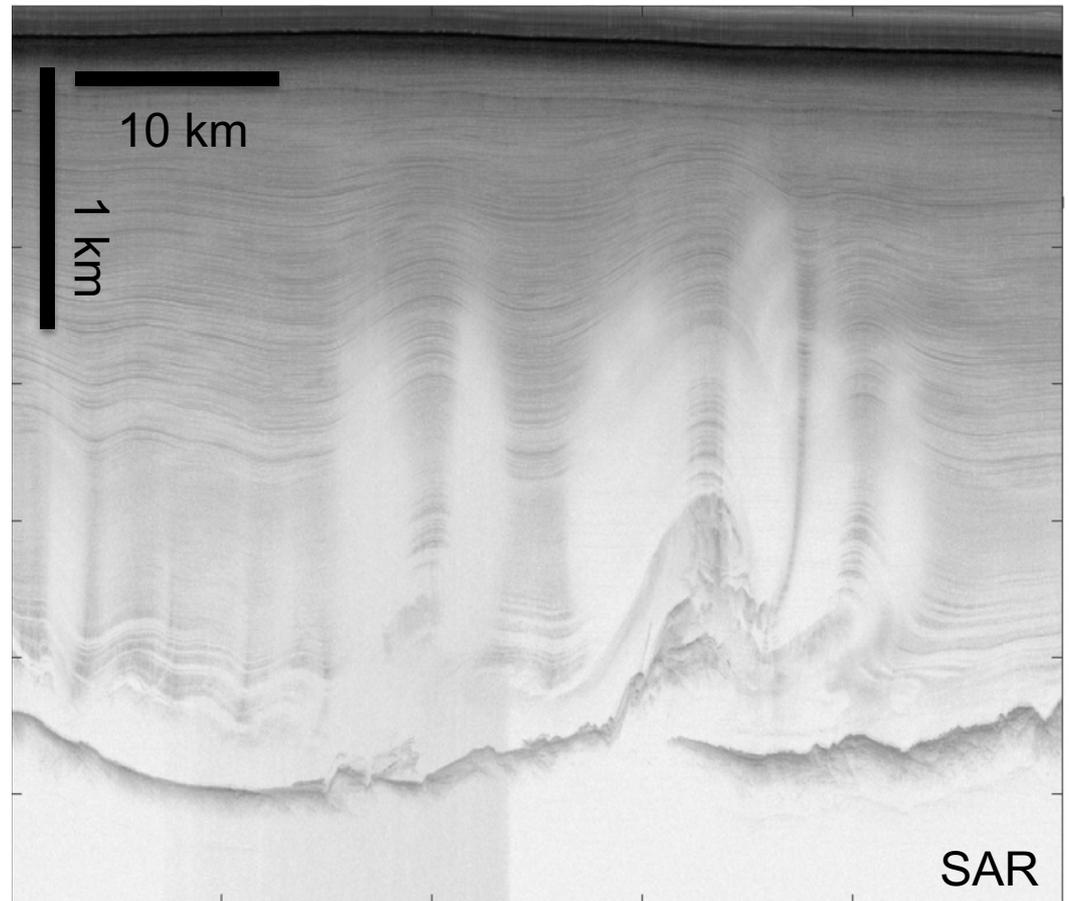
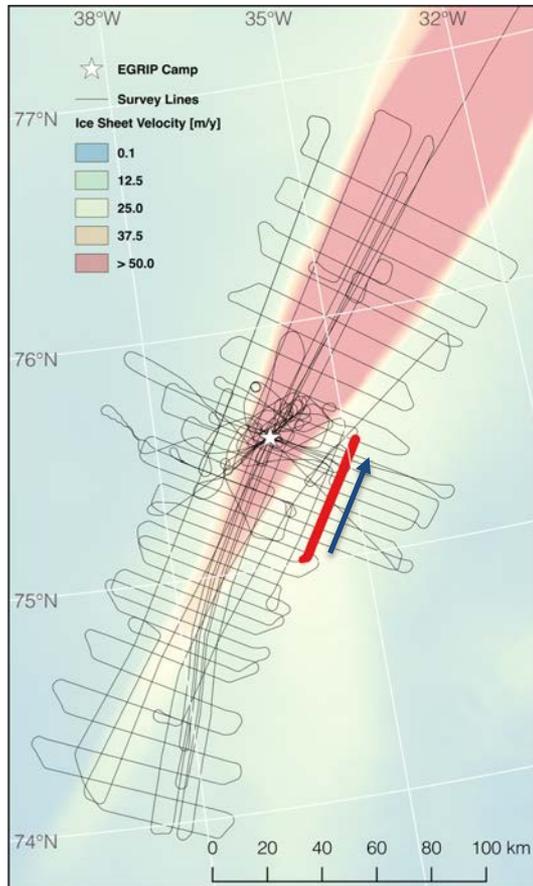
# Bedrock and deformation | parallel to flow



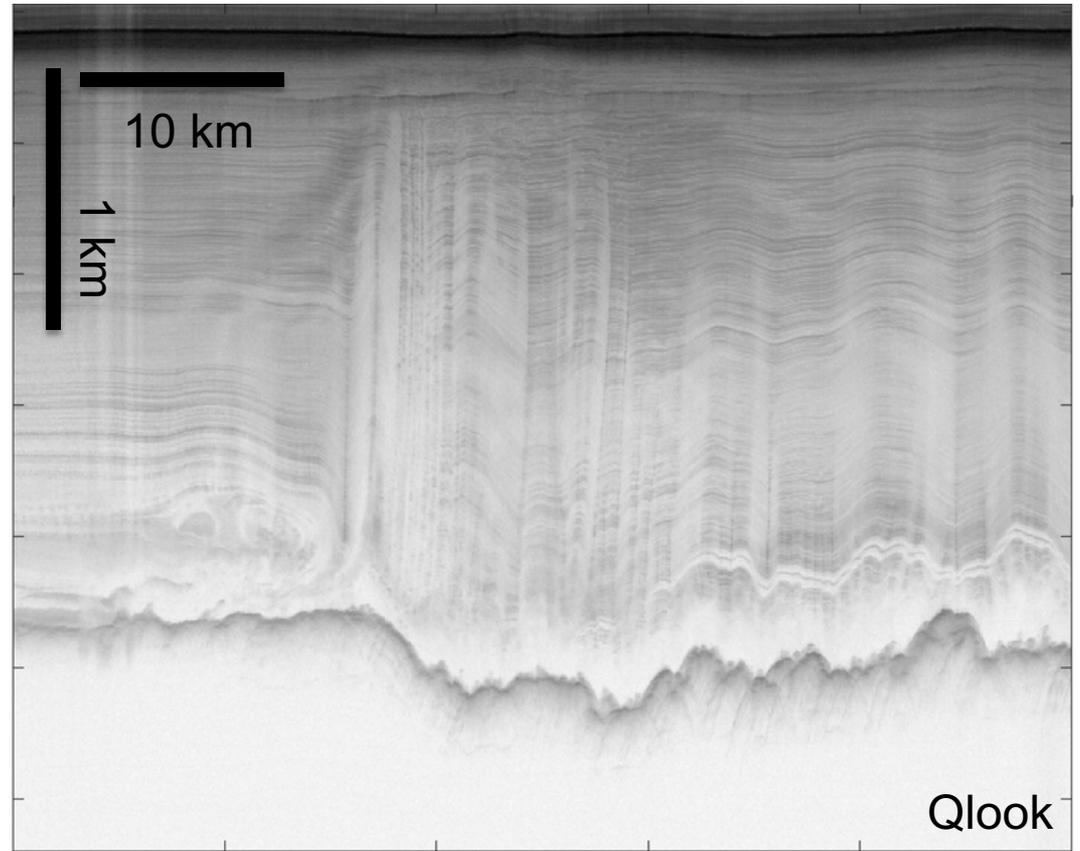
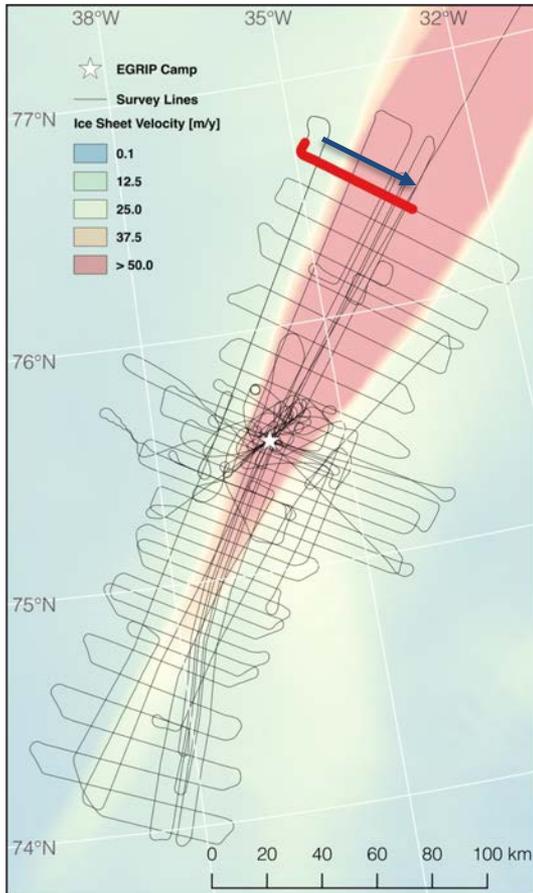
# Bedrock and deformation | orthogonal to flow



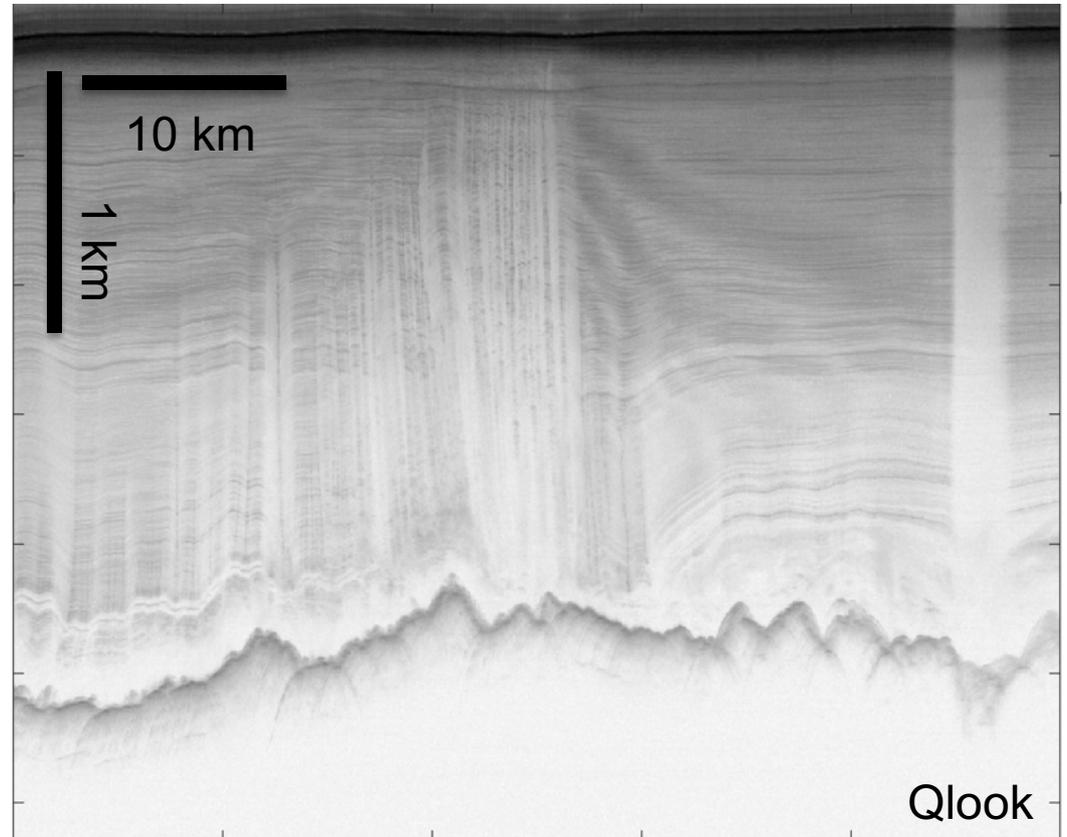
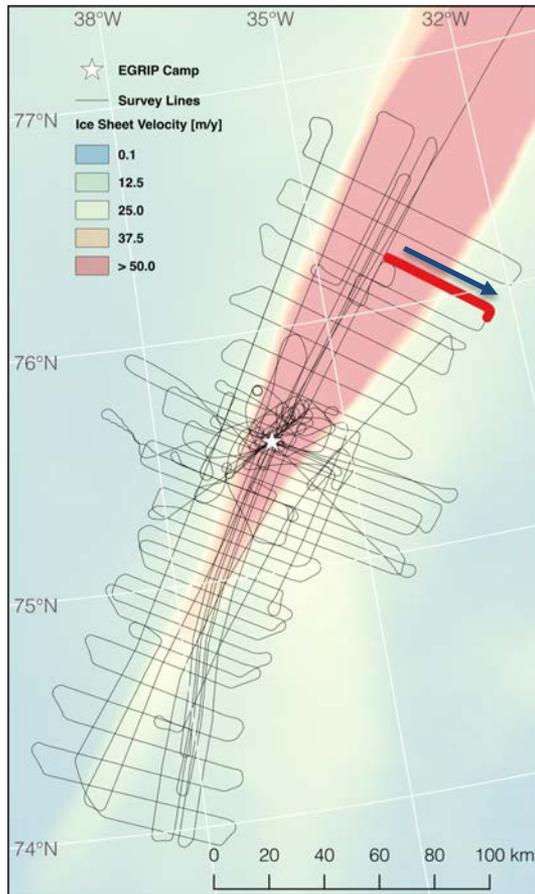
# Bedrock and deformation | uncertainties



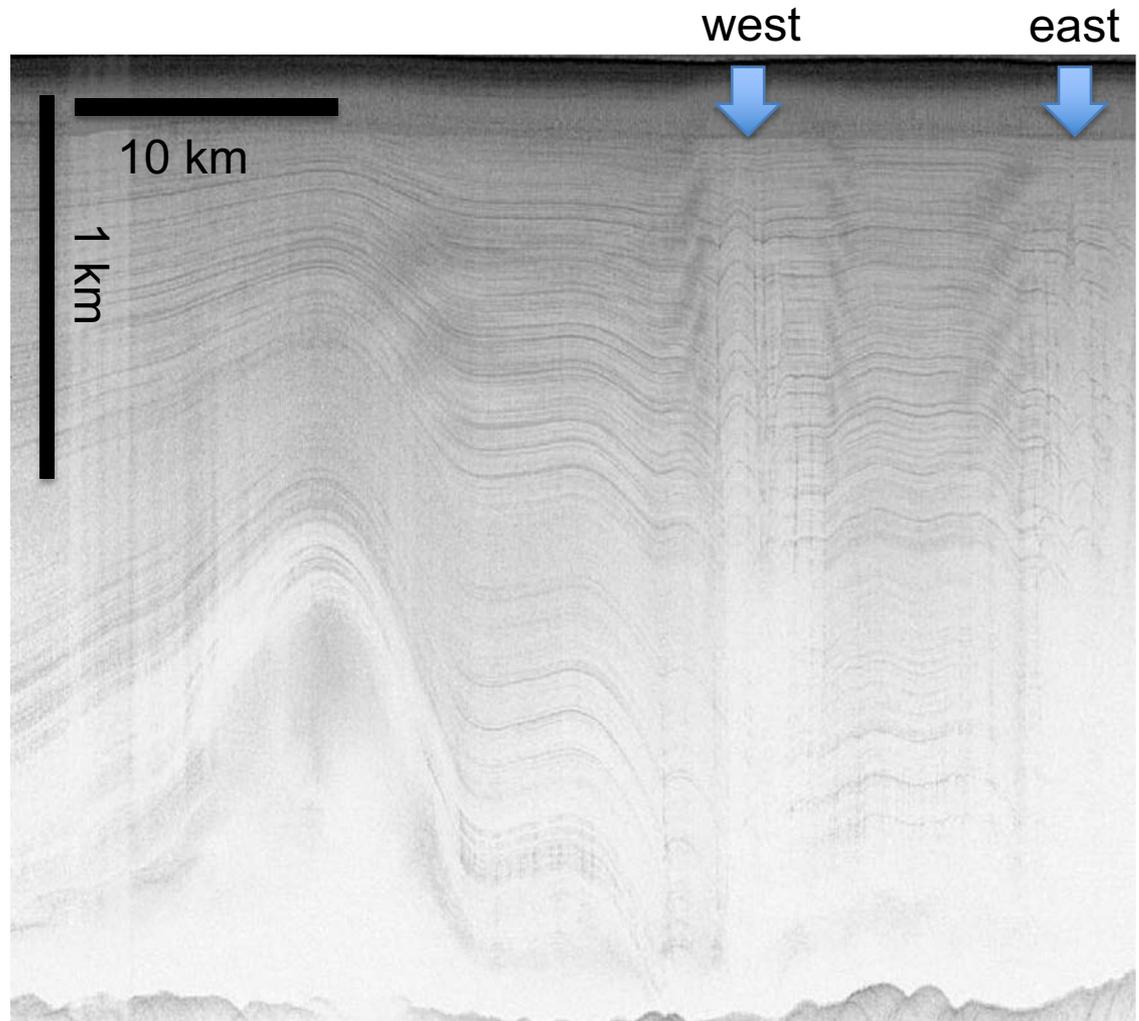
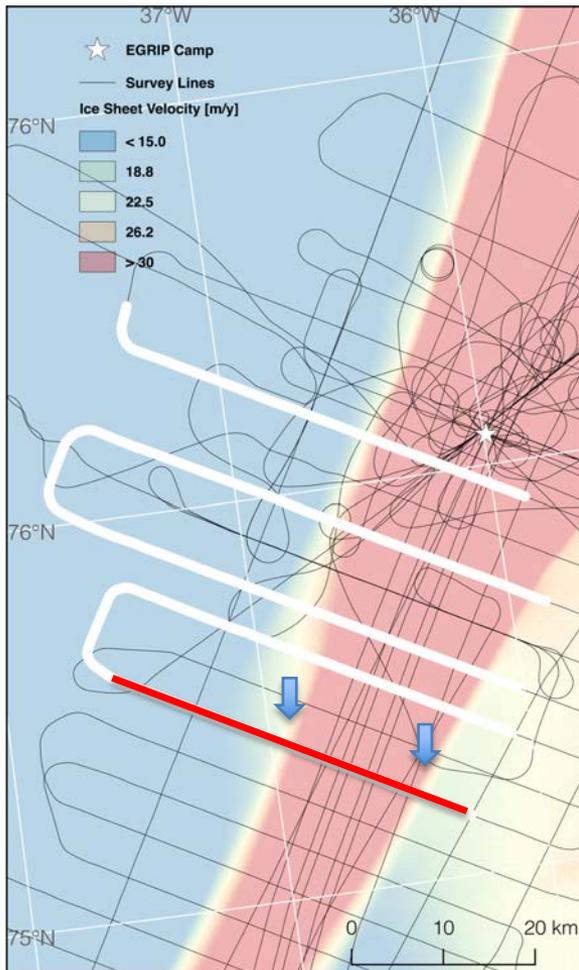
# Shear margin | North



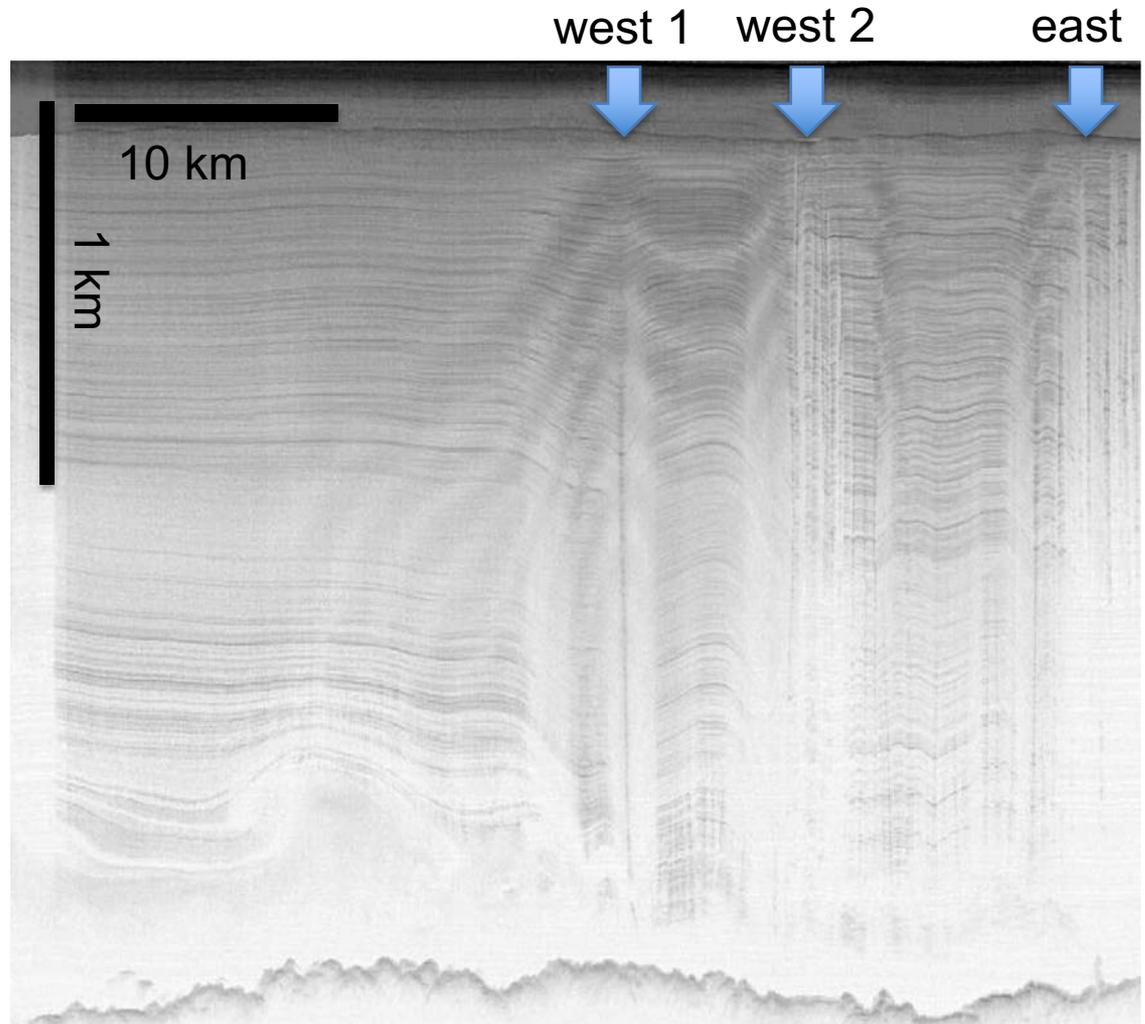
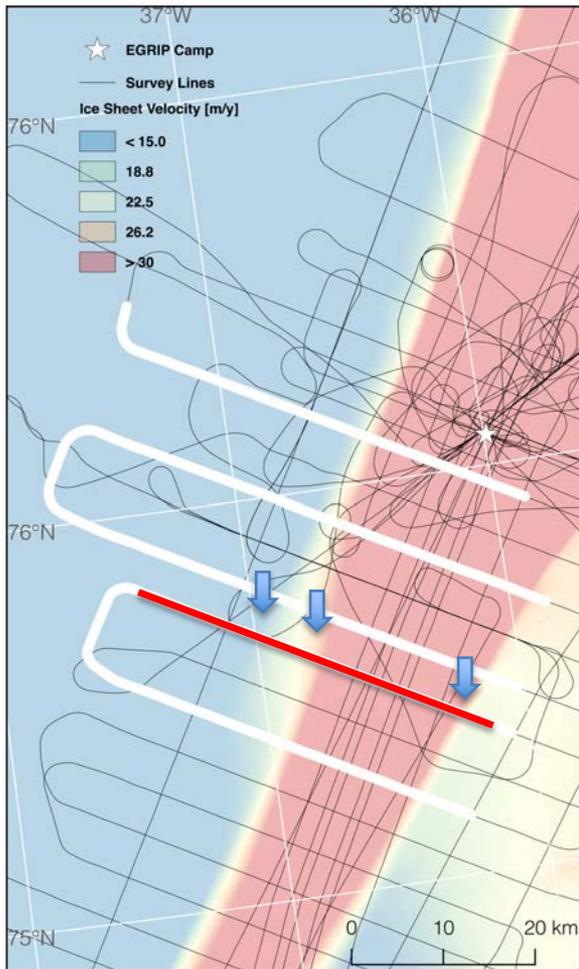
# Shear margin | North



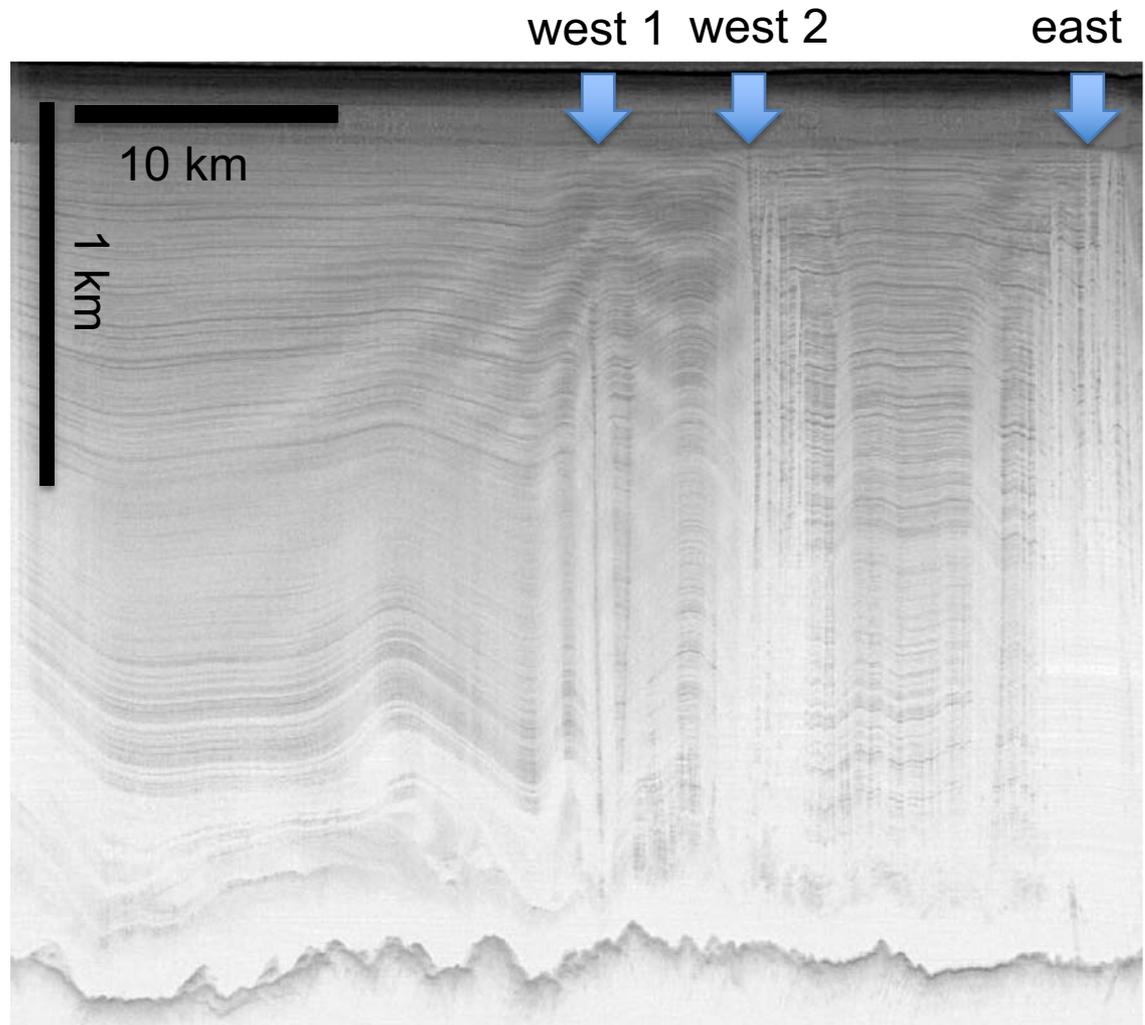
# Shear margin | South



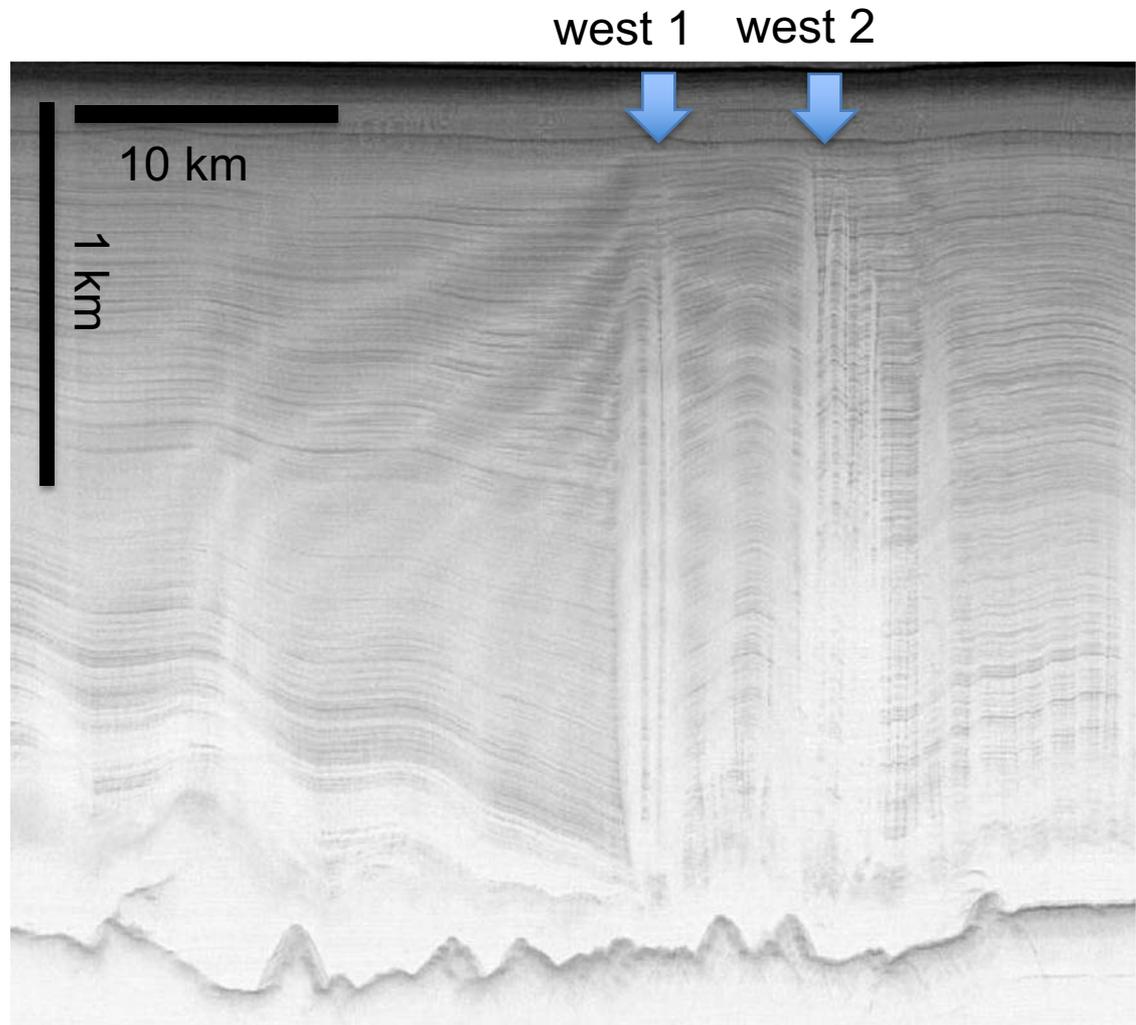
# Shear margin | South



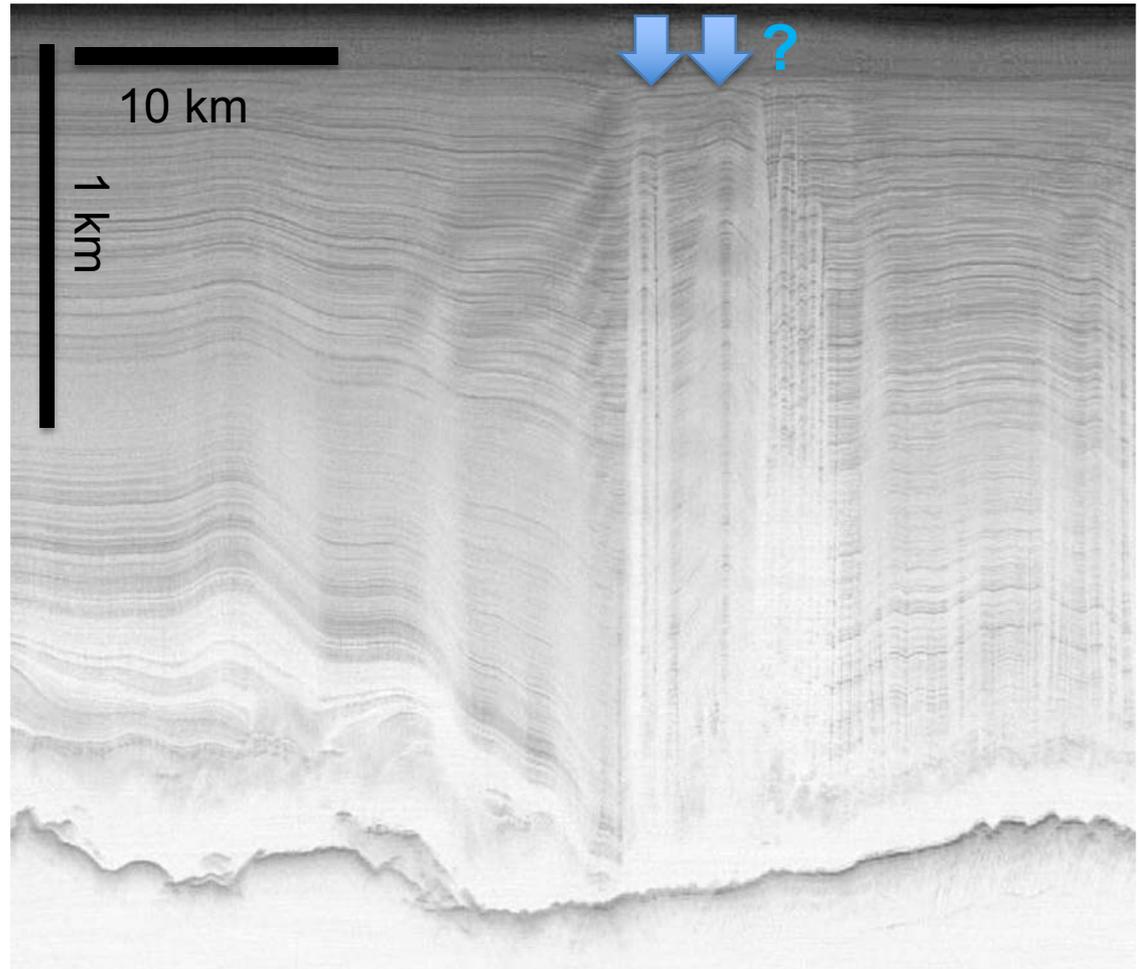
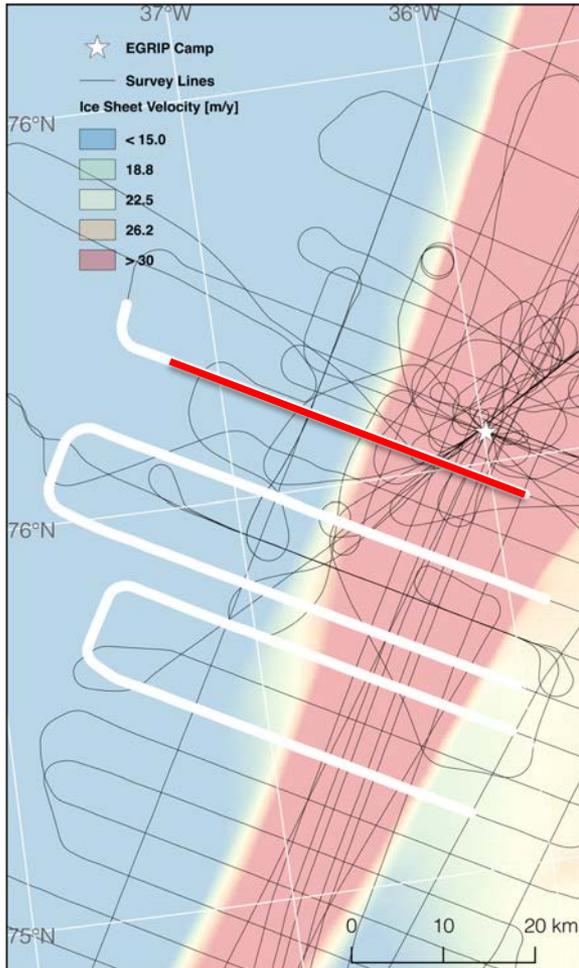
# Shear margin | South



# Shear margin | South



# Shear margin | South



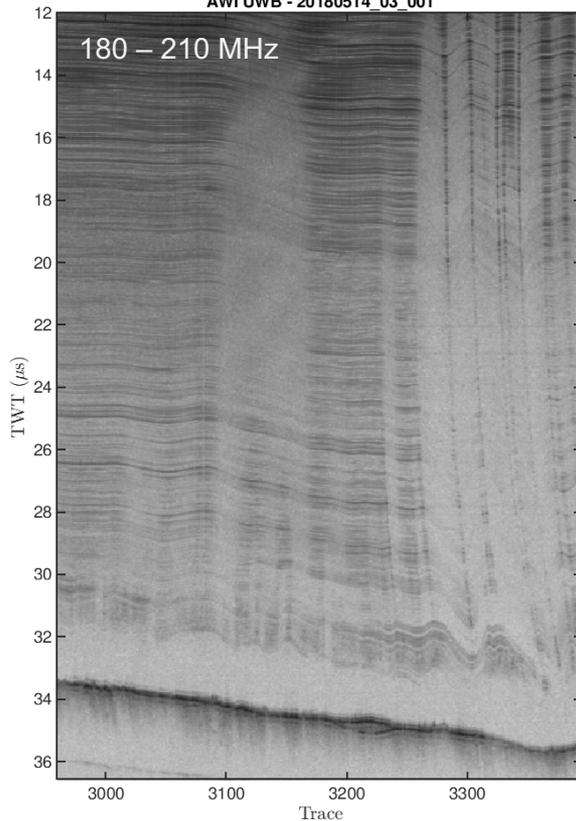
# Radar Systems Compared



## AWI UWB



AWI UWB - 20180514\_03\_001

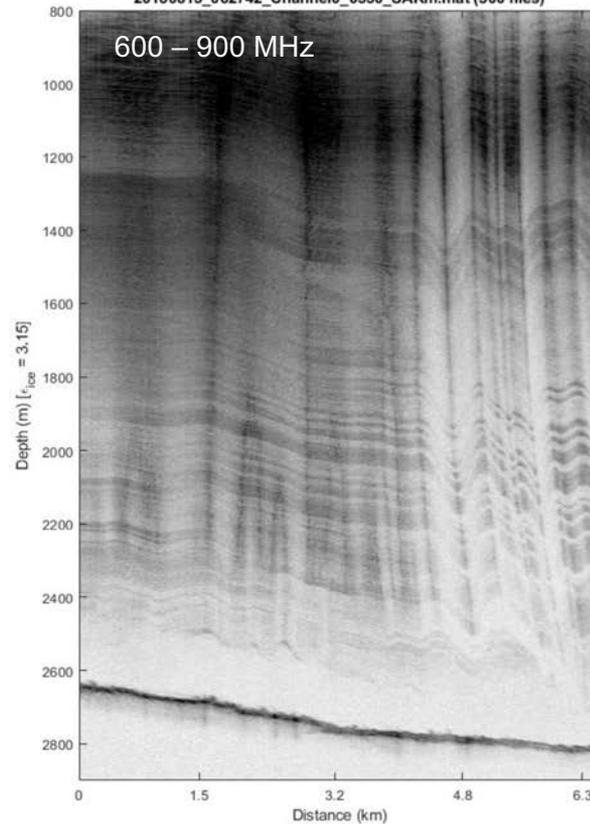


## Mills Cross

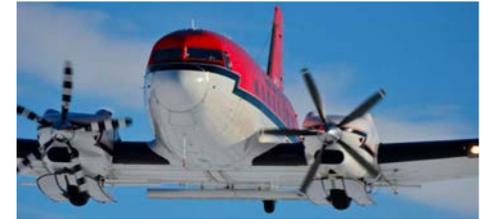


UHF antenna array

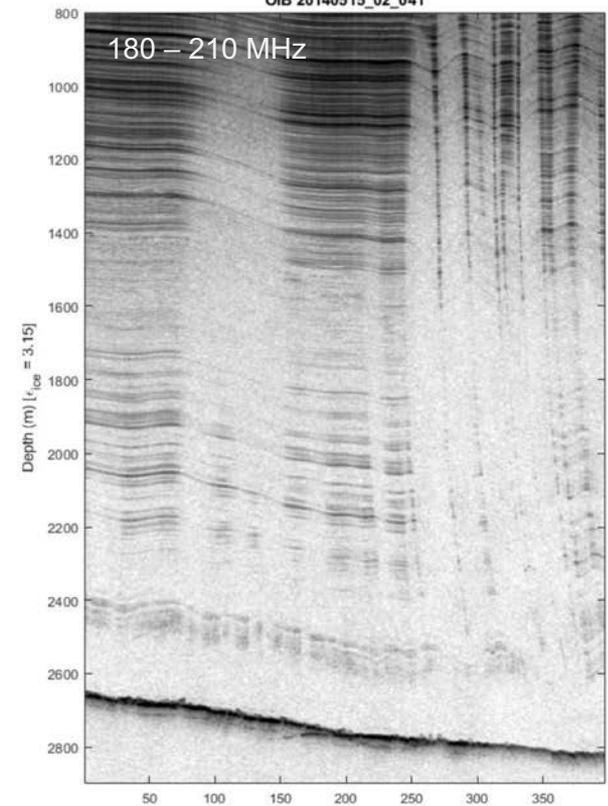
20180815\_062742\_Channel0\_0330\_SARm.mat (500 files)



## Ice Bridge



OIB 20140515\_02\_041



# Next Steps

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1. Create bedrock model
2. Link deformation to ice dynamics
3. Compare radar data with core data

