2011: Morgan Gibson, Jamie Pattison, Fergus Andrew, Mae Aldridge, Robert Barker, Alexander Smith, Katy Boreham, Peter Talbot, Eleri Evans.
2010: Gillian Tuddenham, Greg Tinder, Kjersti Moe, Ben Bryant, Mariana Esteves, Simon Peters, Steve Derbyshire, Stefen Fritz, Craig Jenkinson.

Tunsbergdalsbreen Project

The Tunsbergdalsbreen Project

The Tunbergdalsbreen Project began in 1954 when a pioneering group of young people travelled to western Norway to survey the remote Tunsberg glacier, through a collaboration of Nottingham University and Brathay Exploration Group (BEG). The Tunsberg glacier is the longest glacial arm of the Josterdalen ice cap, stretching 18km in length (shown in Figure 1). The first expeditions surveyed this glacier for ten consecutive years; monitoring the extent and dynamics of the glacier.

In 2009 the Tunsberg glacier project was revived ; as a collaboration between the Norsk Bremuseum, BEG, the Field Studies Coucil and Newcastle University. Two further expeditions have been made to measure the modern day extent of the glacier and compare this with the results from the late 50's.

Since the 1950's significant technological advances have altered the way the fieldwork is carried out but the aims of the project remain the same: to raise environmental awareness and involve young people in the collection of data on the Tunsberg glacier.

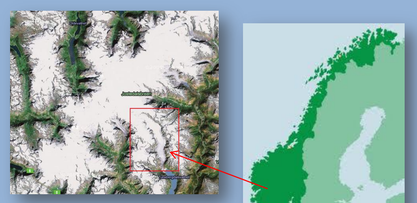

Figure 1: The location of the Tunsberg glacier. www.google/maps.com

Methodology

The expedition aim is to document annual variations of the lower section of the Tunsberg glacier, looking at its snout position, velocity and volume.

- **Front (snout) position** – the snout, or front position of the glacier, is measured from set points in the proglacial area. This is done using laser binoculars which calculate the distance to the front of the glacier ice.
- **Photographic documentation** – A panoramic photo is taken from the same place each year to document how the glacier is changing in relation to its surrounding landscape. The photo is taken from a col to the east of the glacier.
- **Velocity** – two lines of stones are laid across the glacier (velocity profiles) and their positions marked using a handheld GPS. The stones laid down in previous years are also located and the velocity of the glacier and any spatial variations in velocity can be recorded.
- **Volume** – Using dGPS equipment transects are walked up and down the glacier, continuously taking measurements of the elevation of the glacier. From this a digital elevation map is produced and the height of the glacier can be compared from year to year.

Snout position

Figure 2 shows the glacier's front position from 1937, 1966 (from historic maps), 2009, 2010 and 2011. An overall trend of retreat can be seen alongside a change in the snout shape, but in the past three years the glacier has not undergone retreat. The snout advanced by an average of 127 metres between 2010 and 2011; this is possibly due to a difference in measurement time and seasonal variations, but needs future investigation.

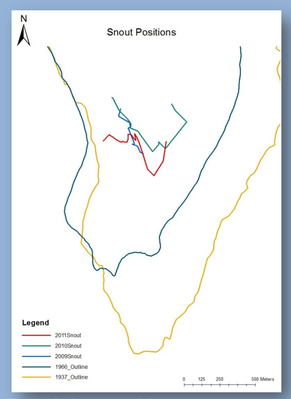

Figure 2: Snout position measurements. Robert Barker.

Panoramic Photos

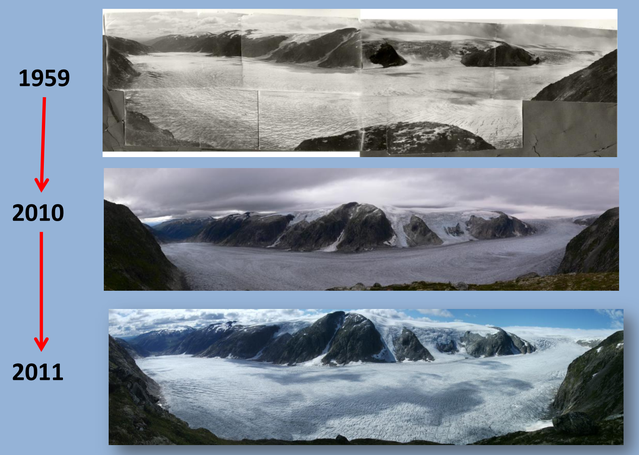

Figure 3/4/5: Panoramic photographs of the Tunsberg glacier in 1959, 2010 and 2011. Steve Derbyshire, Morgan Gibson

Velocity

The velocity of the lower section of the glacier is measured along two profiles; the upper (Figure 6) and lower (Figure 7). The upper profile has a maximum average velocity of 79 m/yr, the lower 43.5 m/yr. Both profiles show a reduction in velocity between 2009-2010 and 2010-2011 (5 m/yr and 7 m/yr, respectively); to verify this as a continuing trend data from future years also needs to collected.

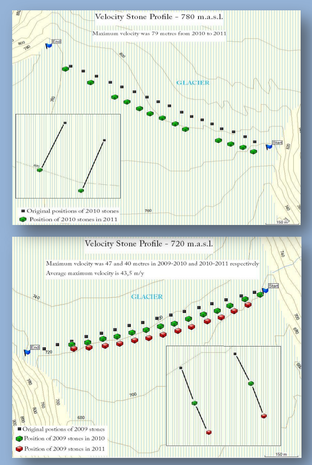

Figure 6/7: Velocity stone profiles, Upper and Lower, respectively. Pal Kielland

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Volume

The volume of the glacier is calculated from the elevation measurements taken along the transects (and then extrapolated for the whole area) and base maps of the glacier.

Although volume gain in seen is some areas between 2010 and 2011 there is a general trend of volume loss, seen in Figure 8. More data is needed to verify this as an ongoing trend.

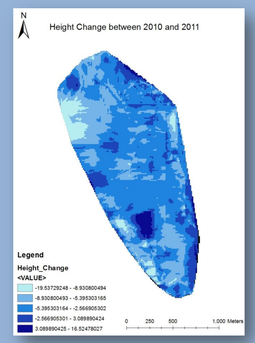

Figure 8: Volume change between 2010 and 2011. Robert Barker

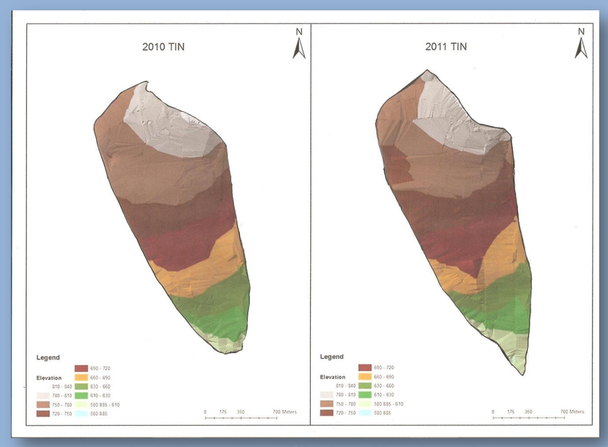

Figure 9/10: Volume models of 2010 and 2011. Robert Barker.

Conclusion

Between 2010 and 2011 a reduction in velocity and volume of the lower section of Tunsbergdalsbreen has taken place, but 2 years worth of data does not provide enough evidence for trends in the glacier dynamics of Tunsbergdalsbreen to be established. To understand the dynamics of Jostedal's largest outlet glacier and determine whether these changes in ice volume and velocity are continuing trends further repetitions of this data collection need to be carried out in the future.

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