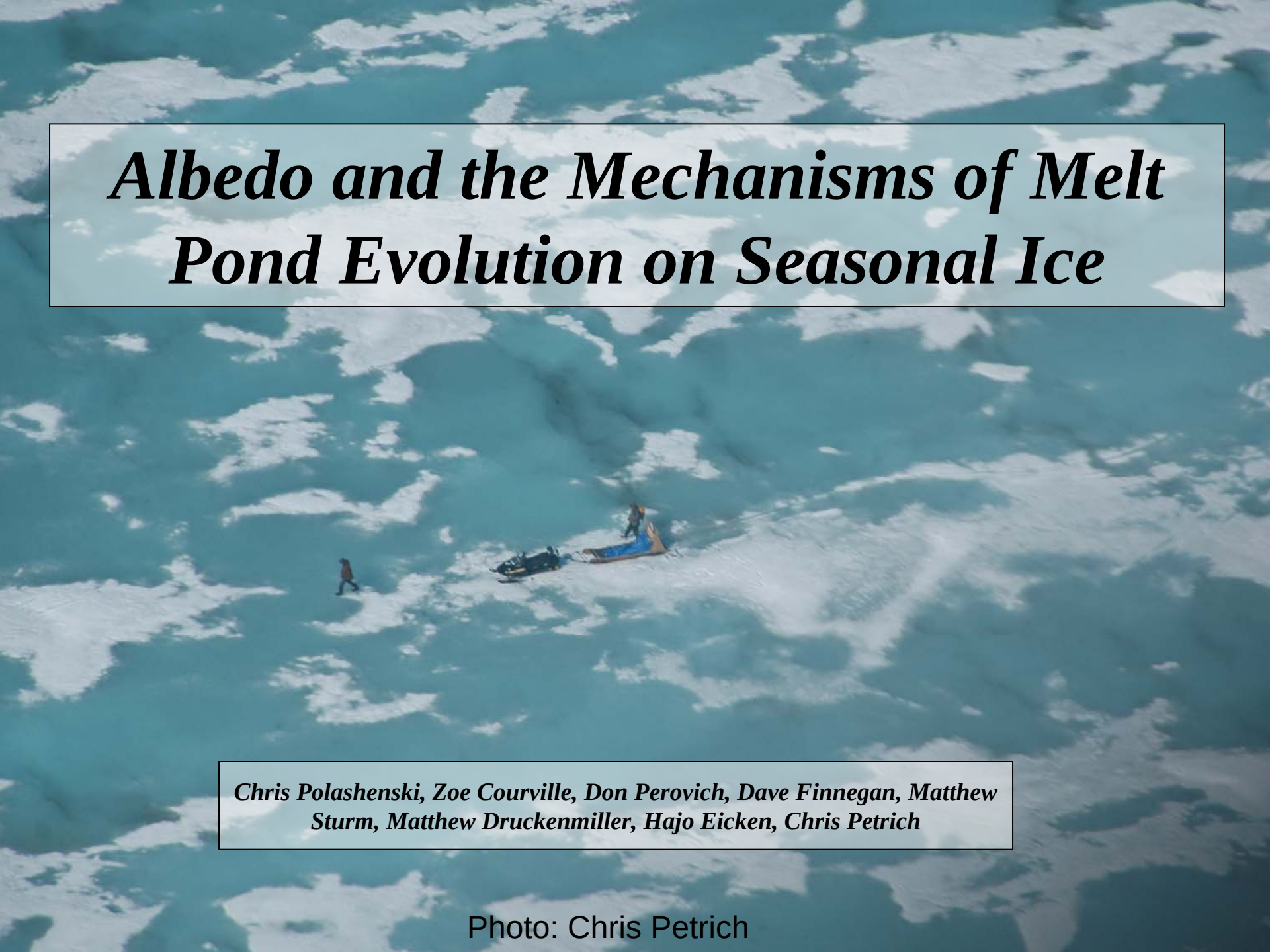
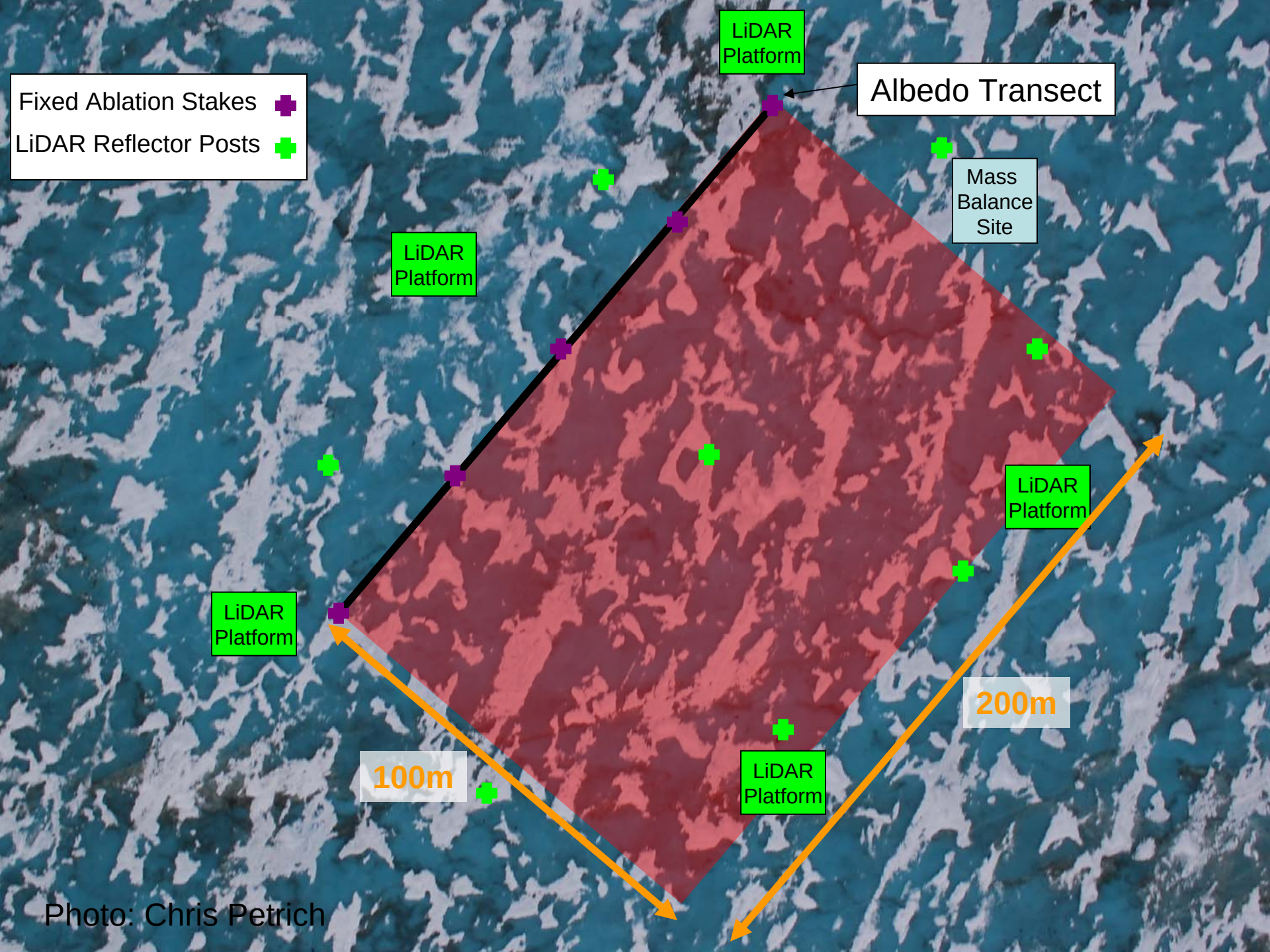
Albedo and the Mechanisms of Melt Pond Evolution on Seasonal Ice

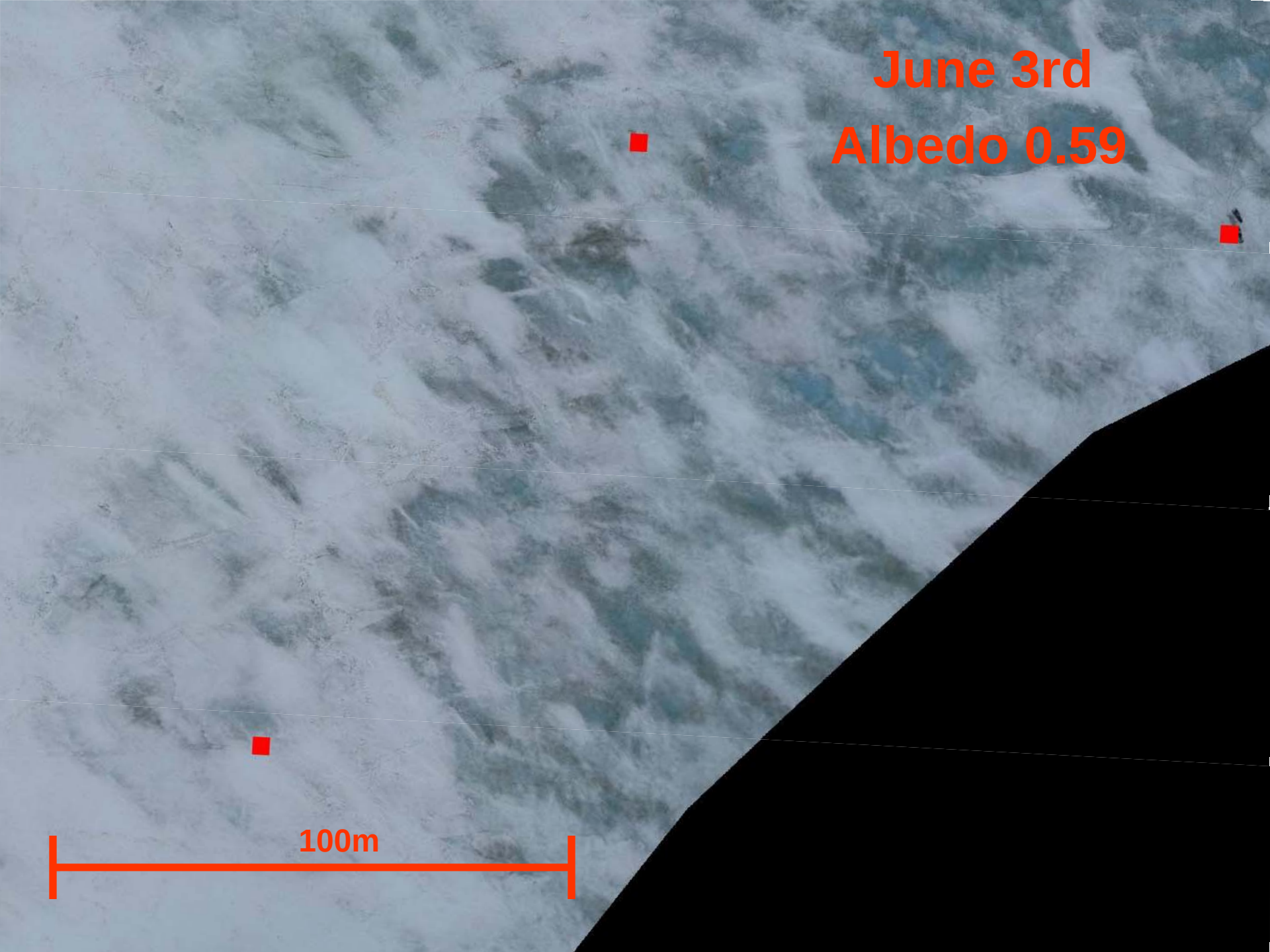


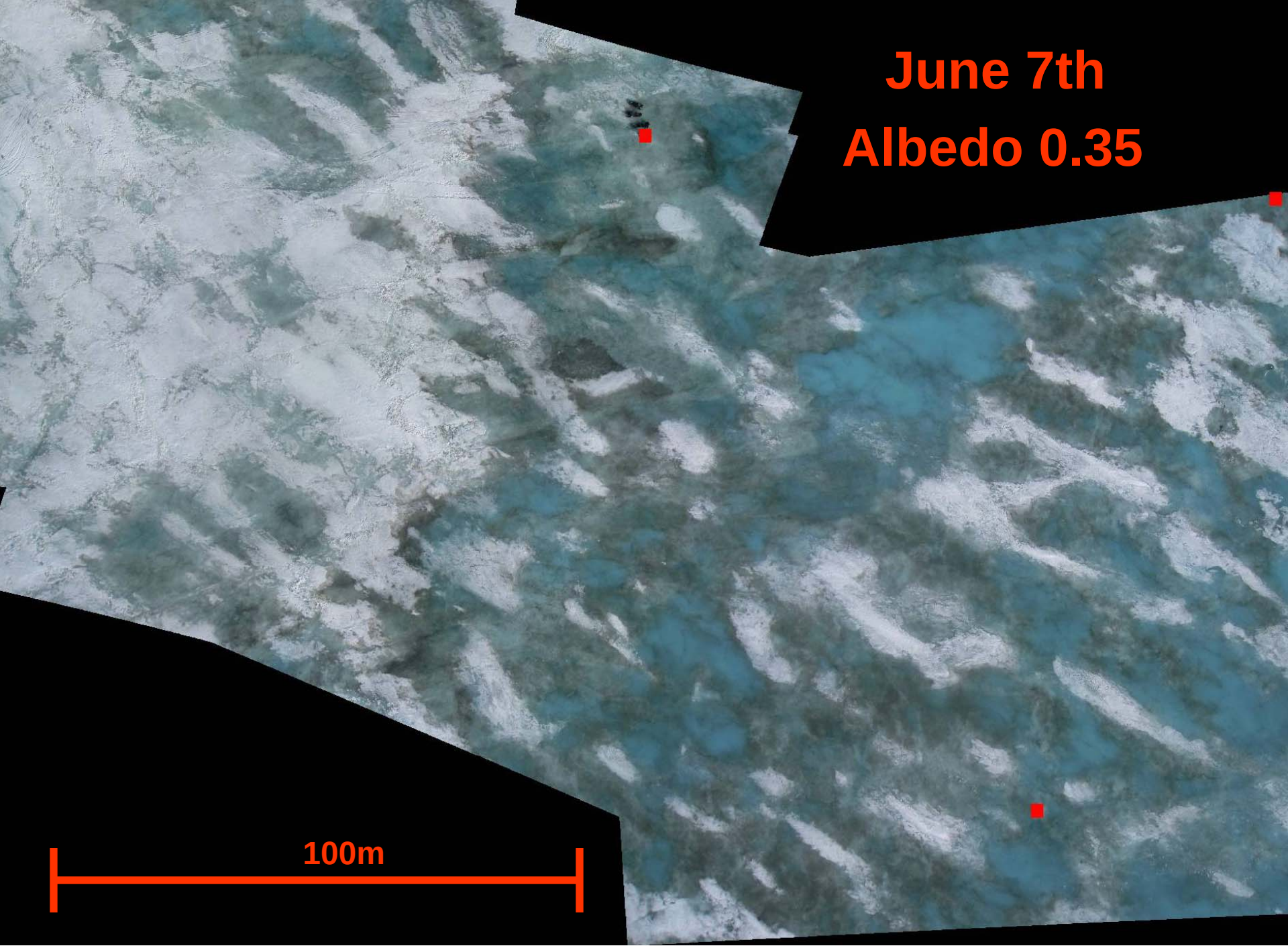
Chris Polashenski, Zoe Courville, Don Perovich, Dave Finnegan, Matthew Sturm, Matthew Druckenmiller, Hajo Eicken, Chris Petrich

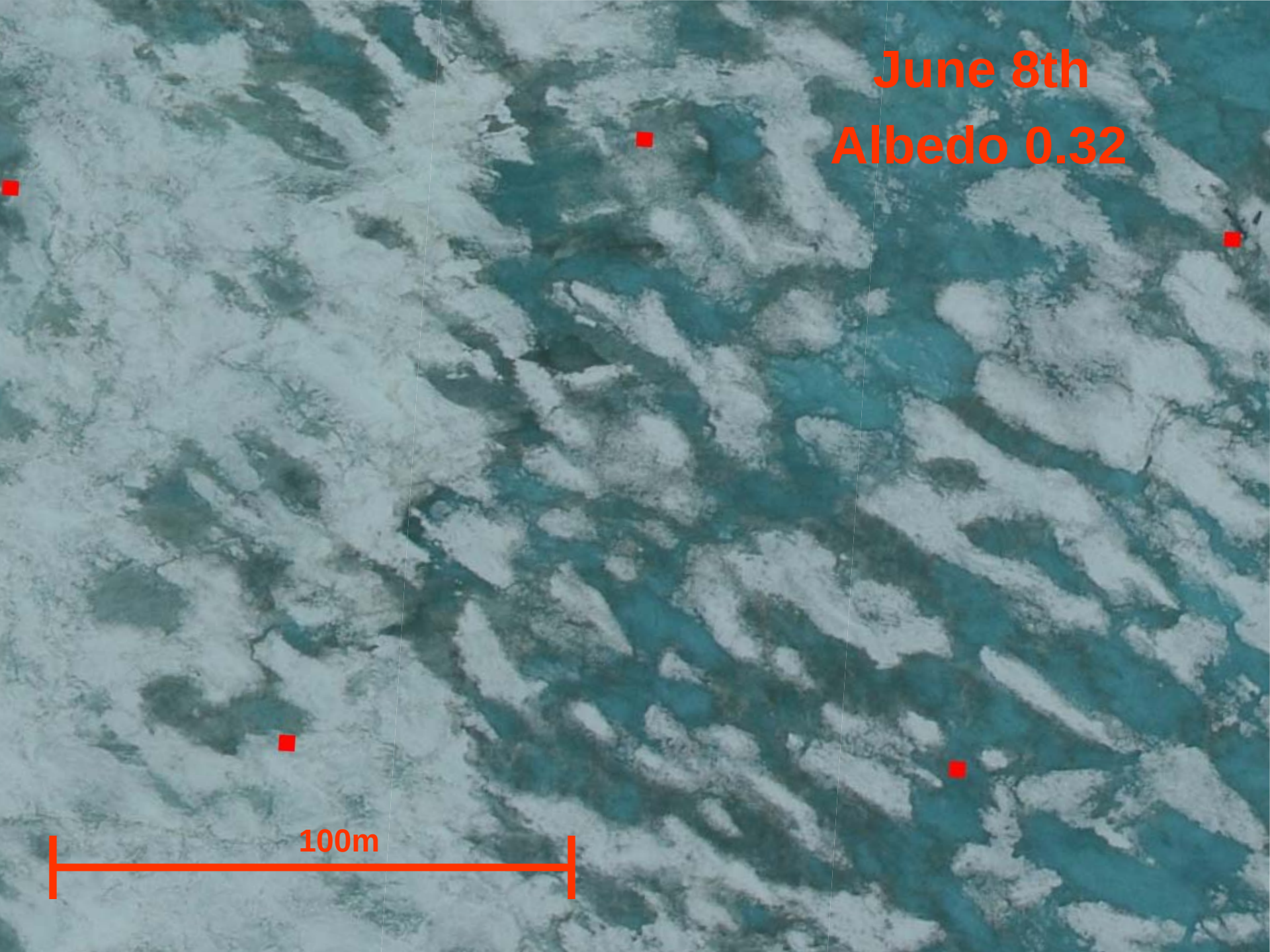
Photo: Chris Petrich

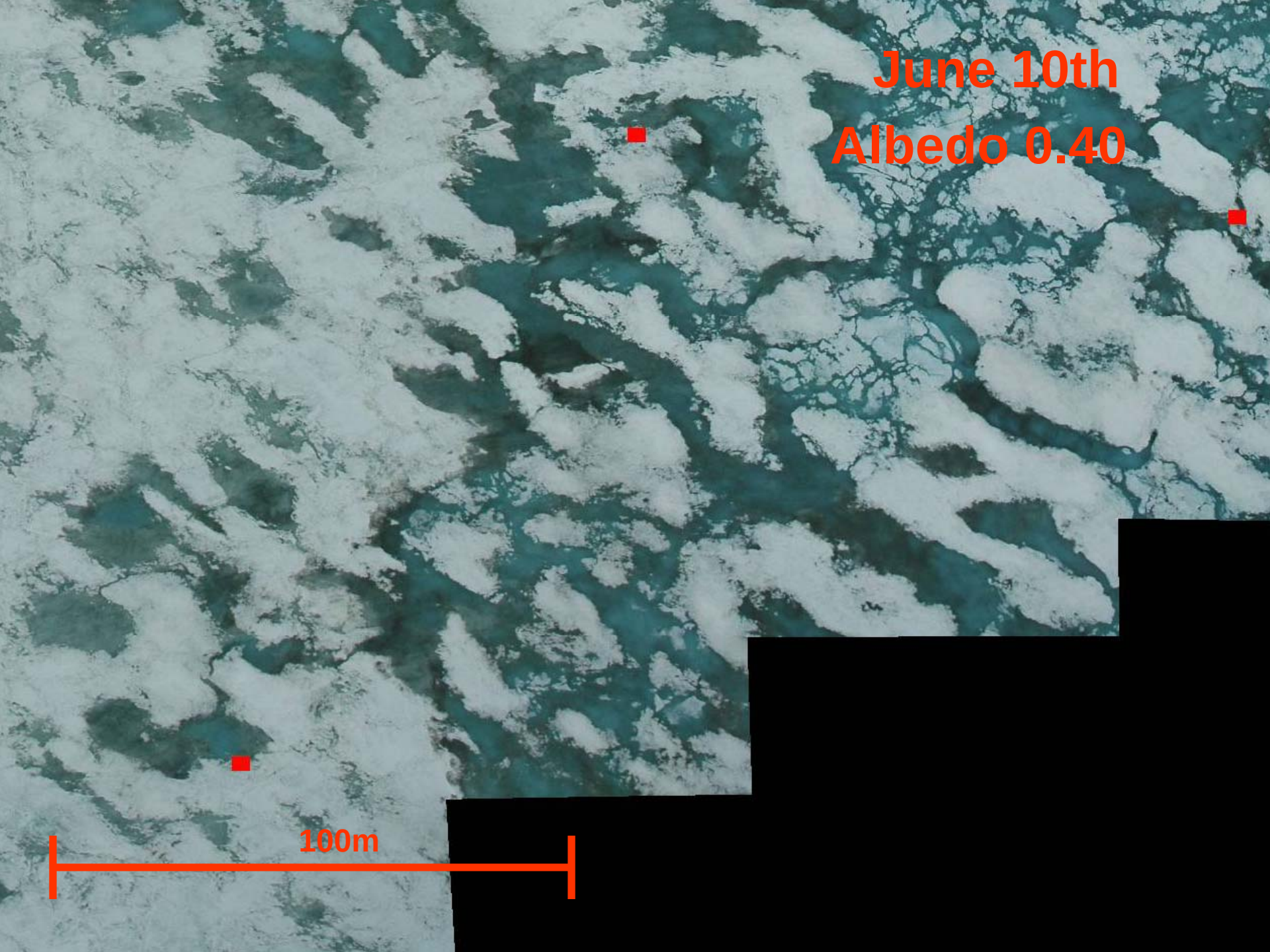

Fixed Ablation Stakes
LiDAR Reflector Posts
LiDAR Platform
Albedo Transect
Mass Balance Site
LiDAR Platform
LiDAR Platform
LiDAR Platform
LiDAR Platform
100m
200m
Photo: Chris Petrich

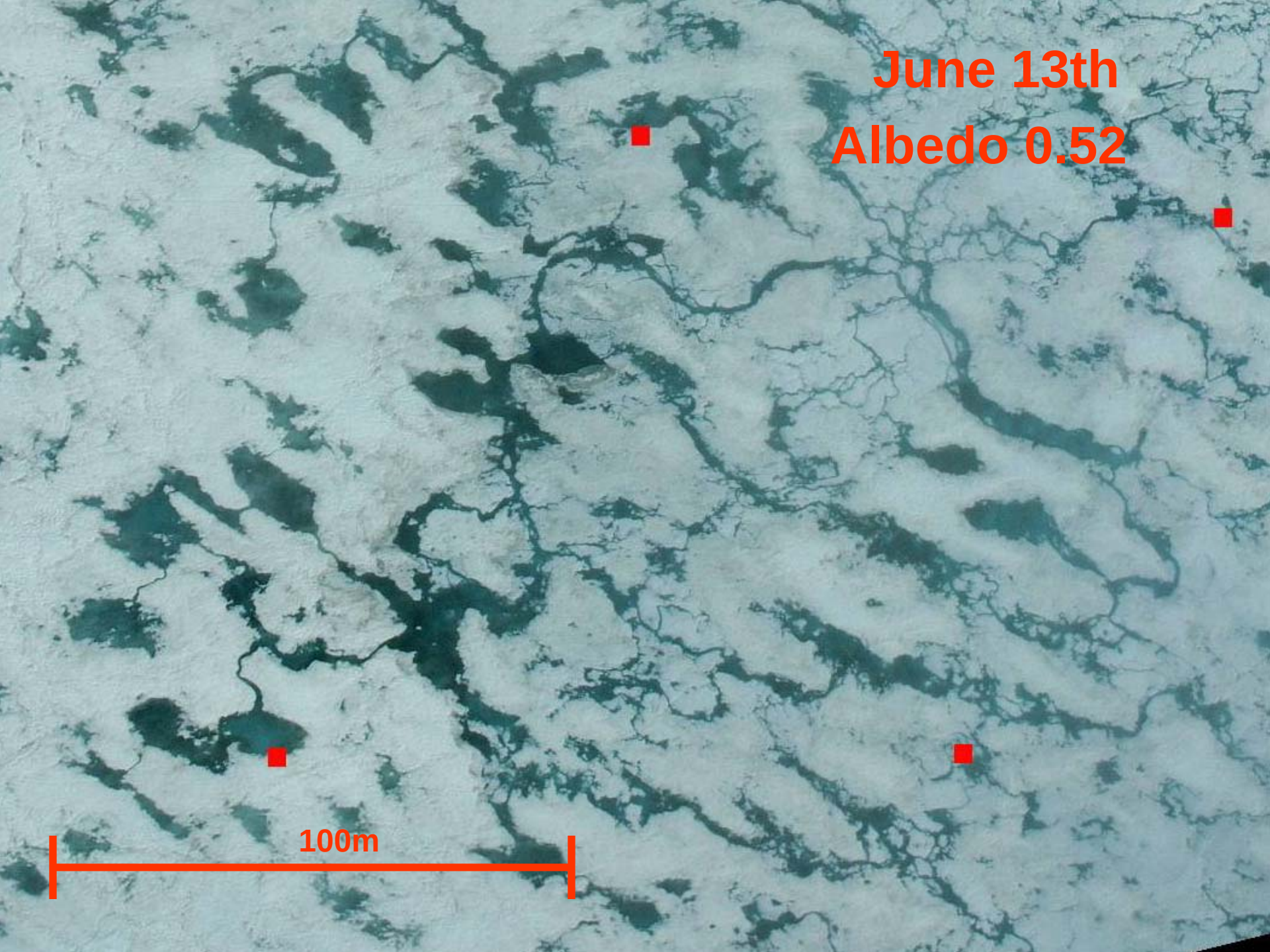

June 1st
Albedo ~0.79
100m


June 3rd
Albedo 0.59
100m

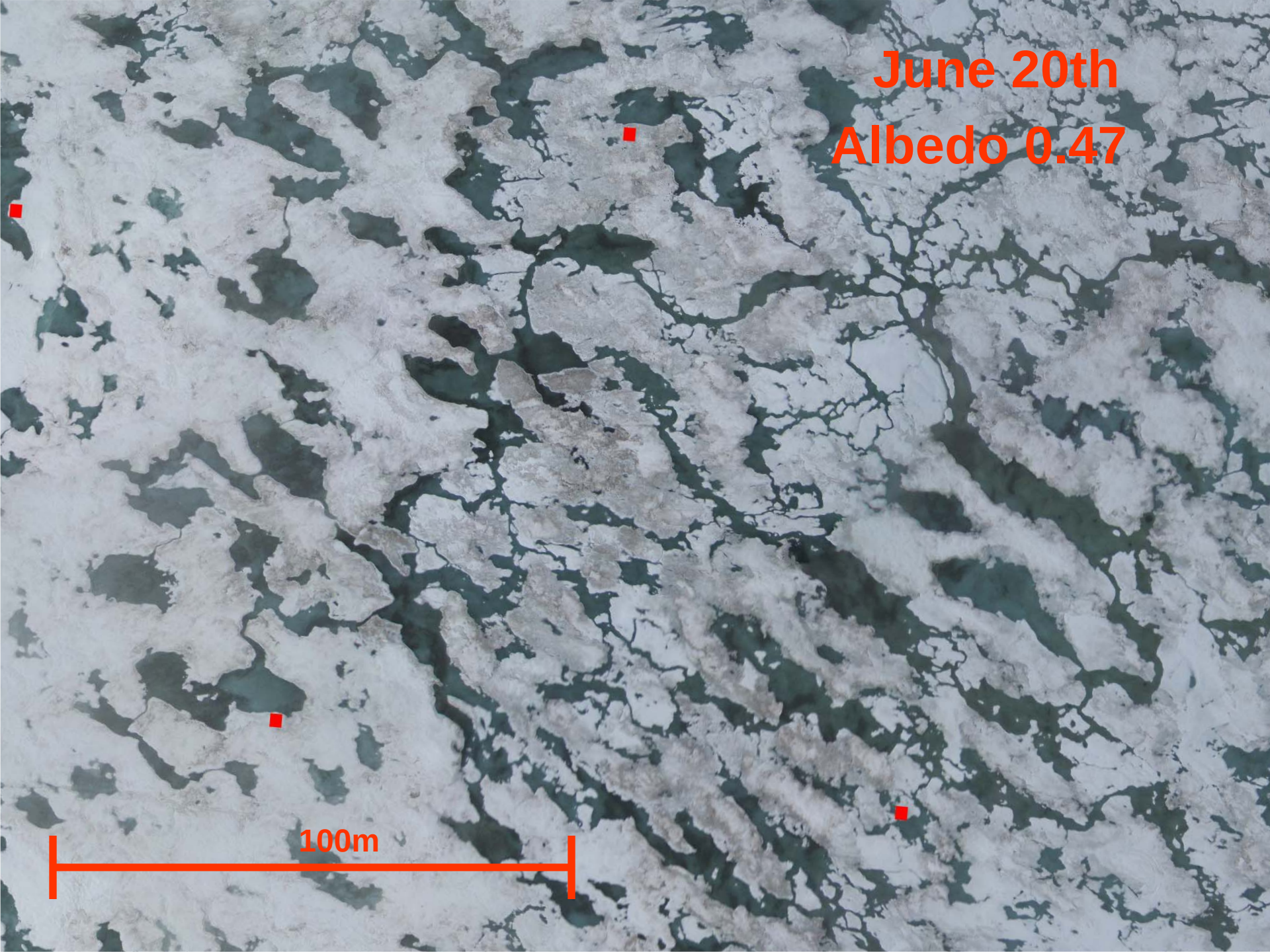

June 7th
Albedo 0.35
100m

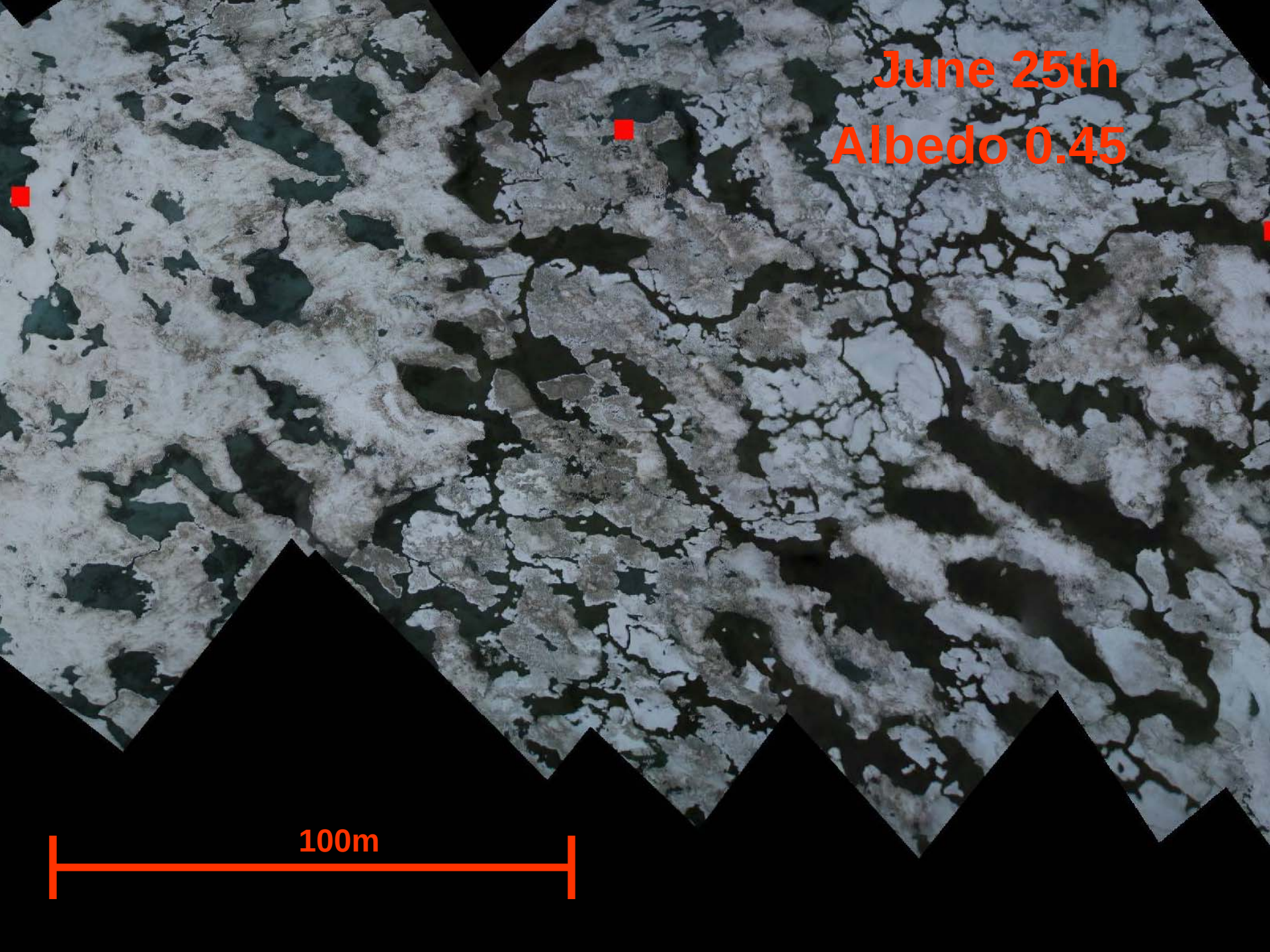

June 8th
Albedo 0.32
100m


June 10th
Albedo 0.40
100m

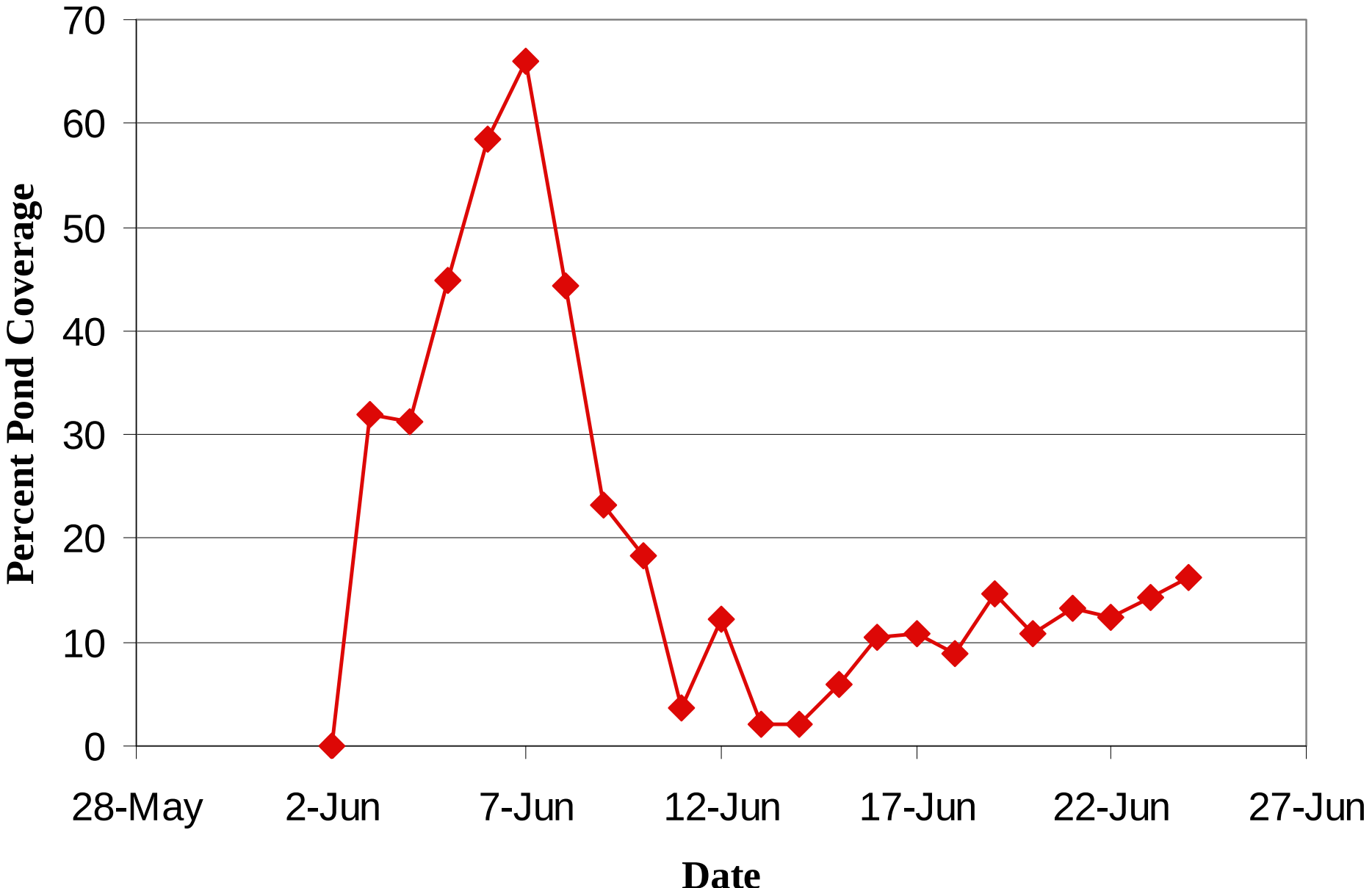

June 13th
Albedo 0.52
100m


June 15th
Albedo 0.58
100m

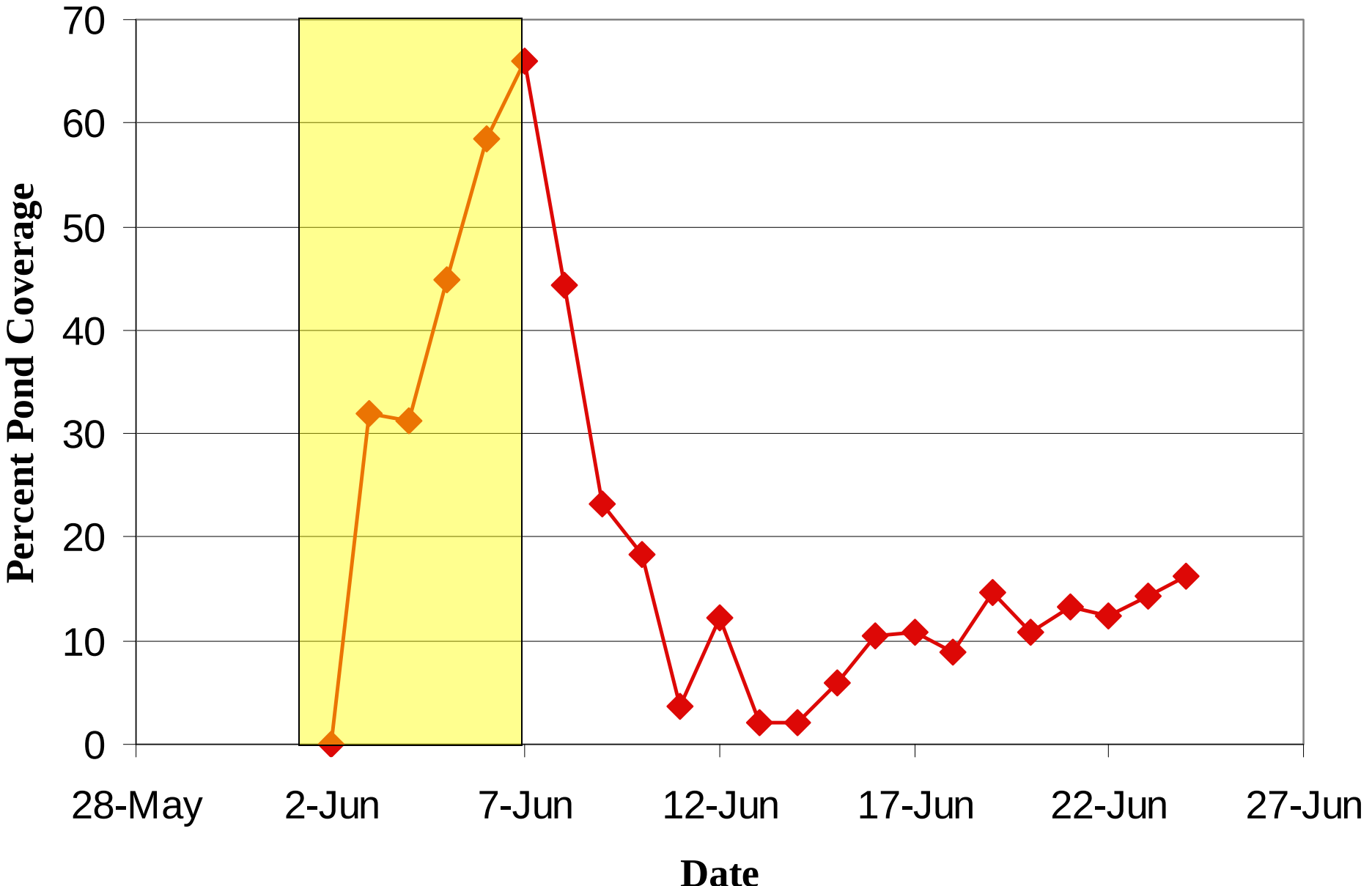

June 20th
Albedo 0.47
100m


June 25th
Albedo 0.45
100m

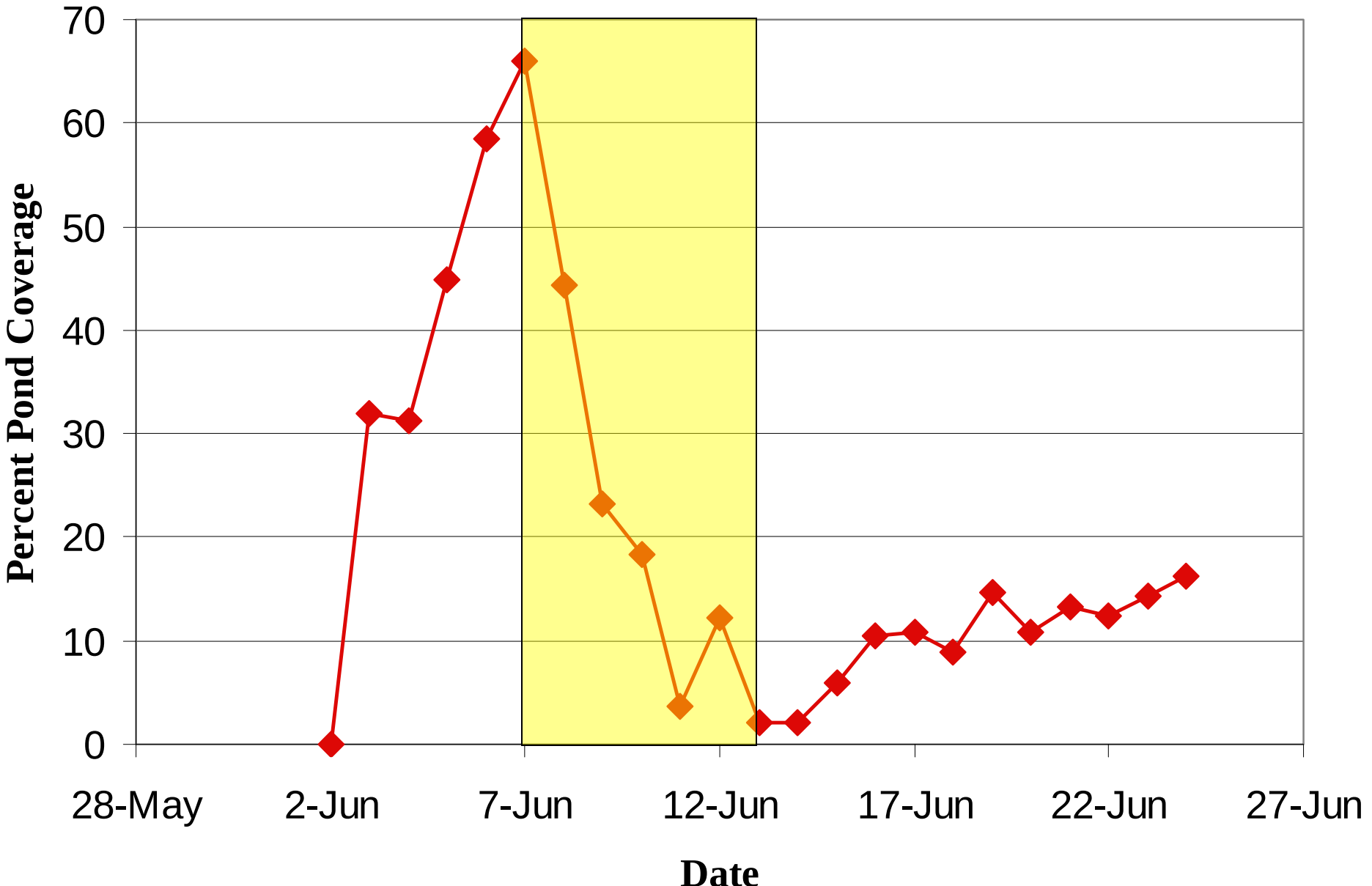
Melt Pond Coverage, South Site



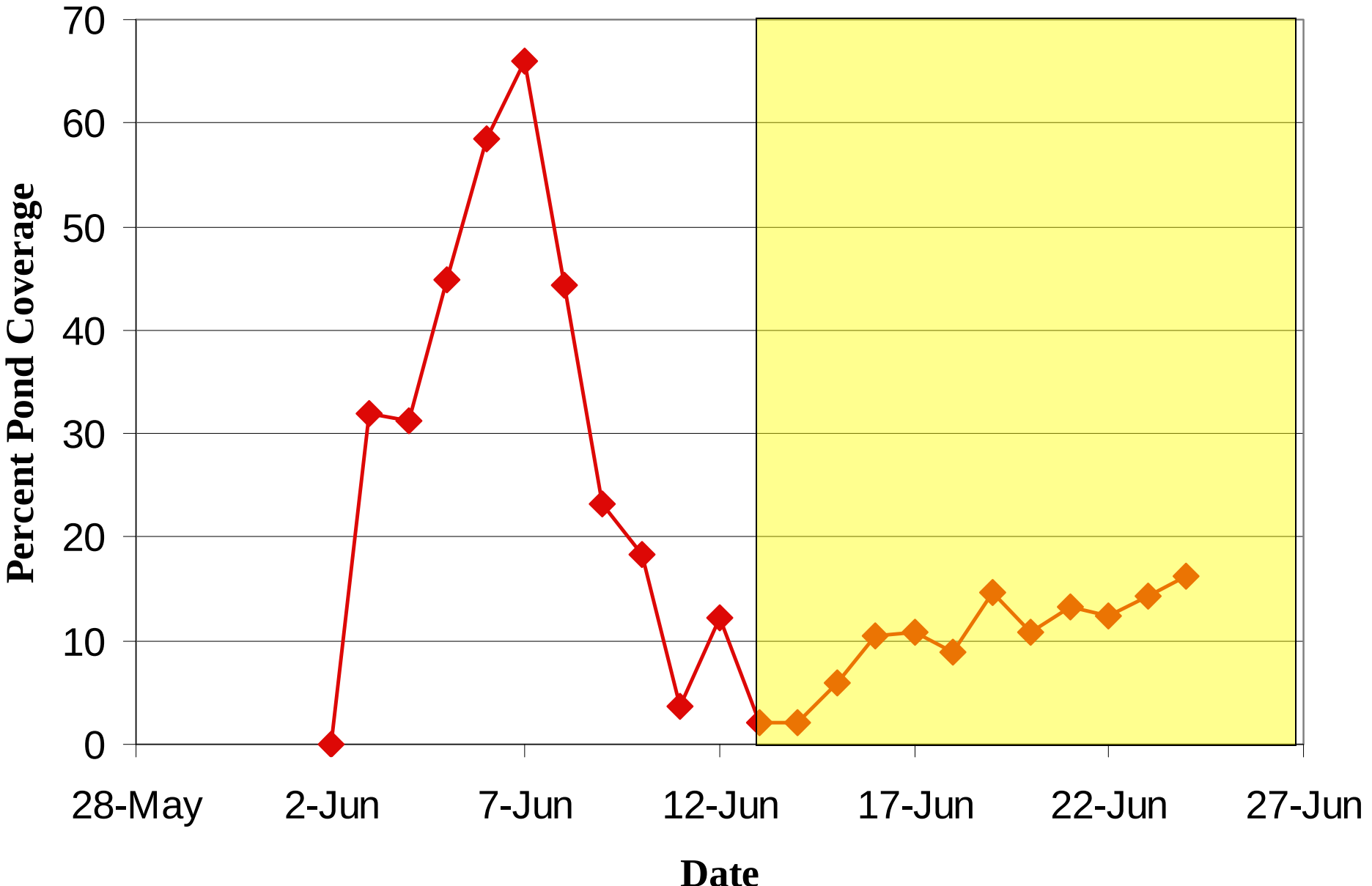
Melt Pond Coverage, South Site

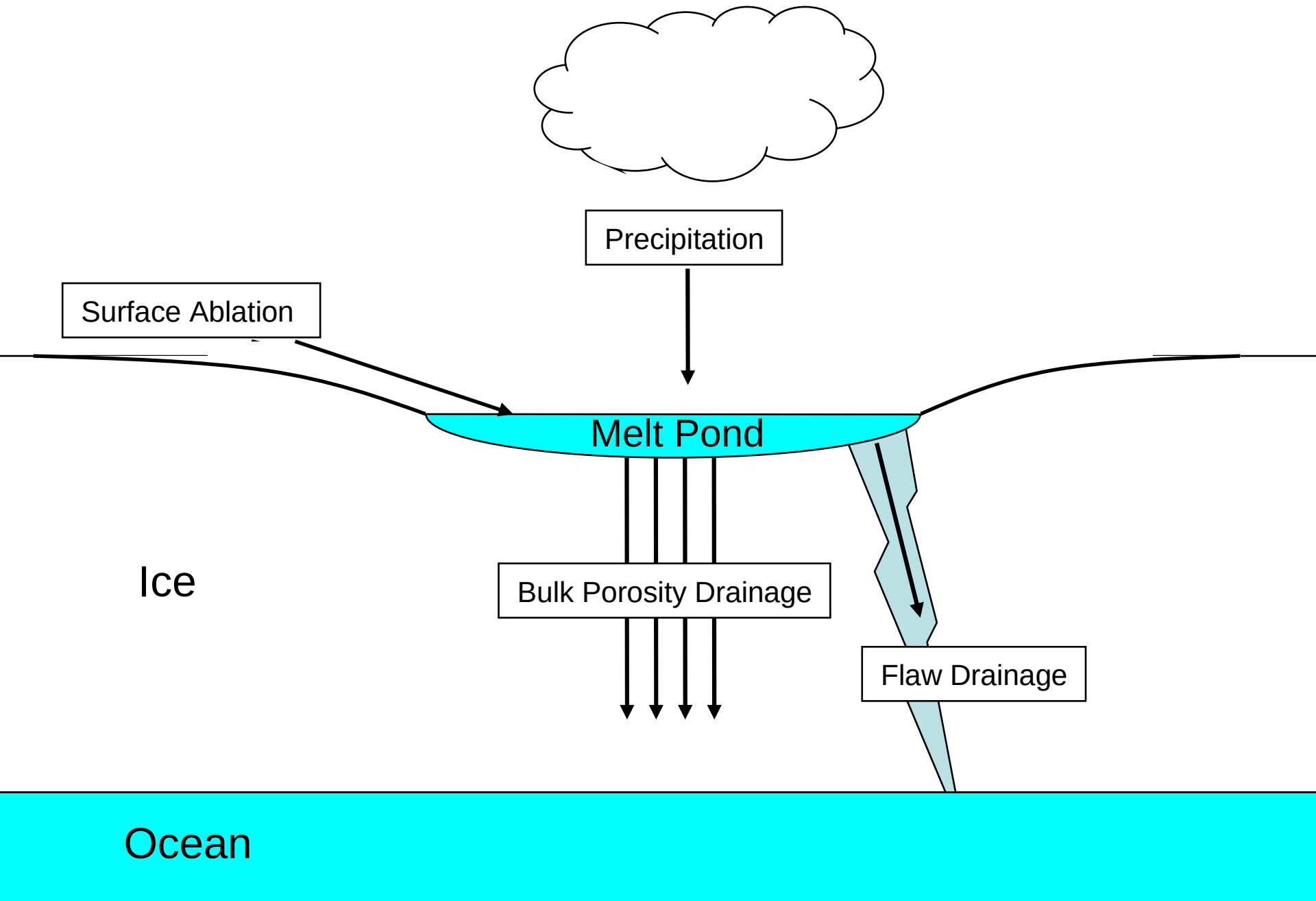


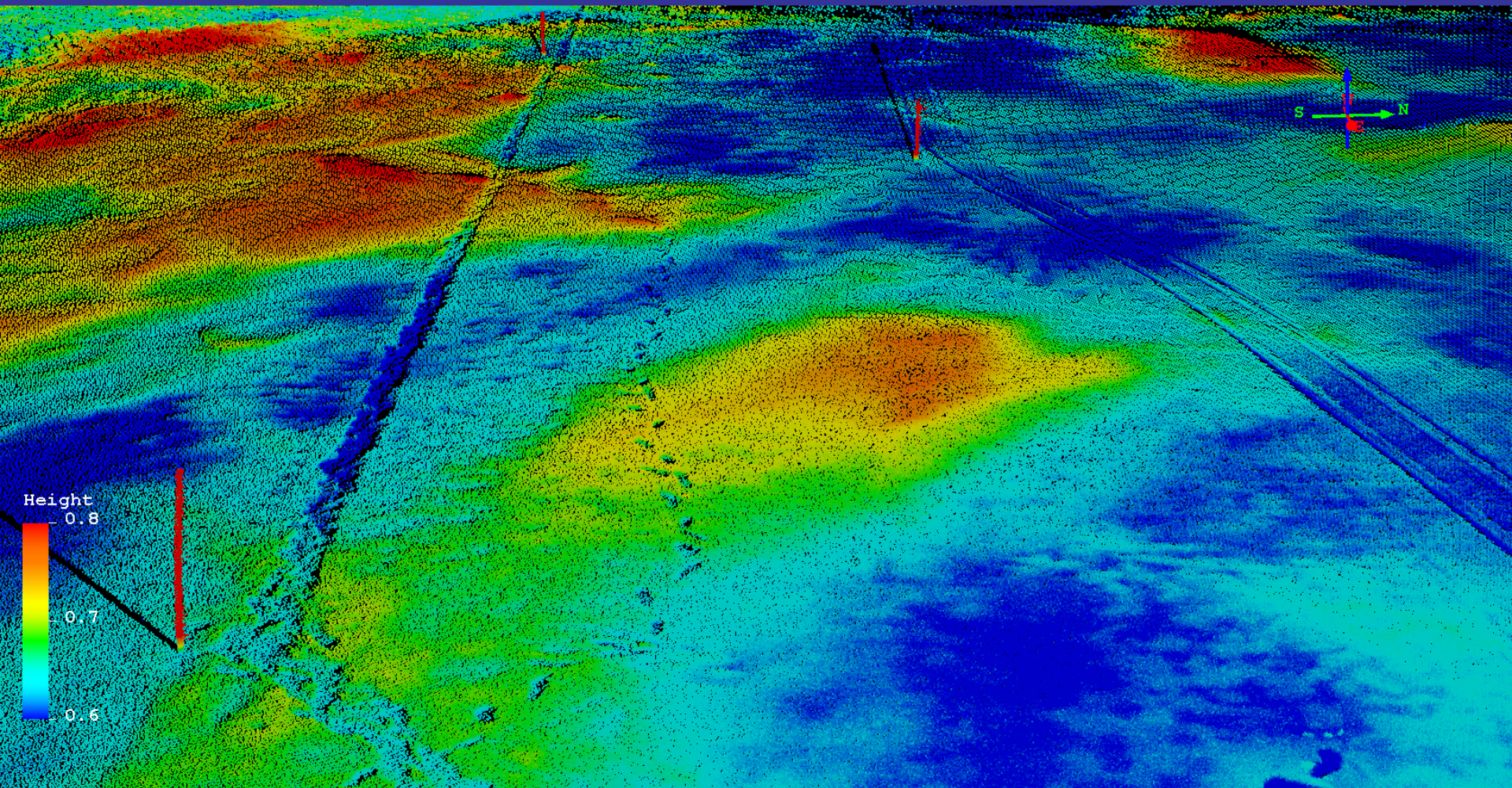
Melt Pond Coverage, South Site



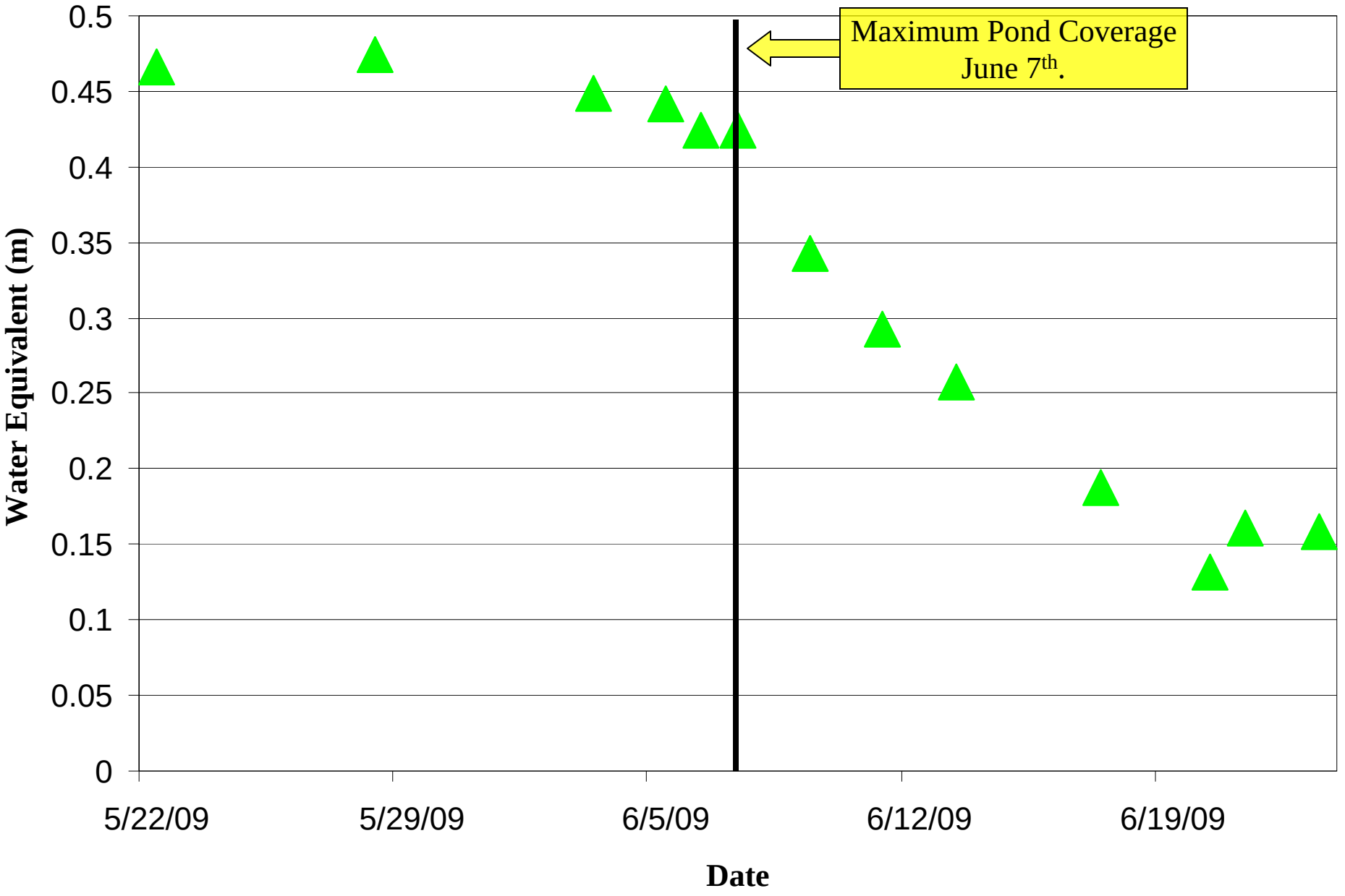
Melt Pond Coverage, South Site



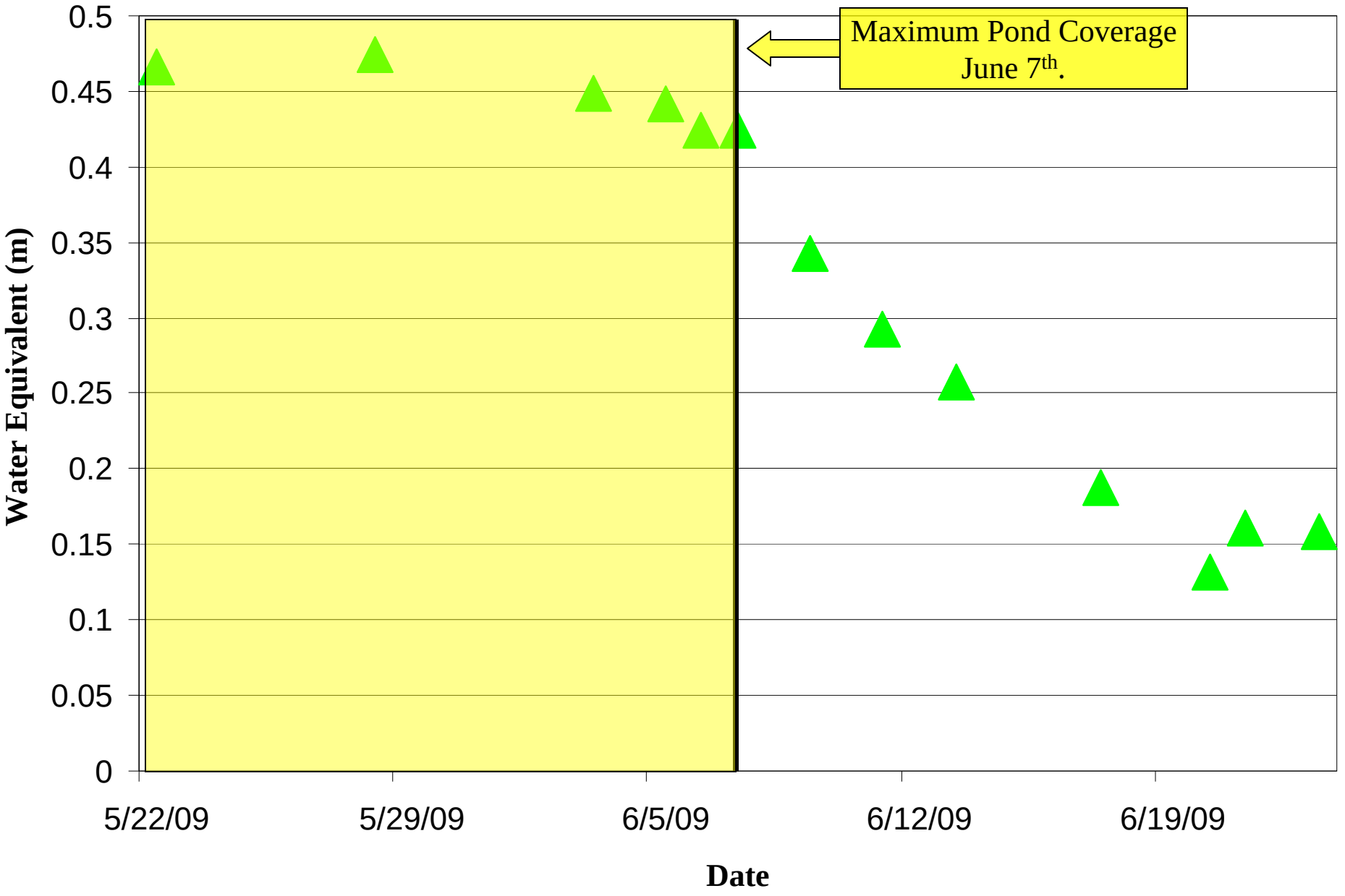

Precipitation
Surface Ablation
Melt Pond
Ice
Bulk Porosity Drainage
Flaw Drainage
Ocean


Height
0.8
0.7
0.6
S
N
E

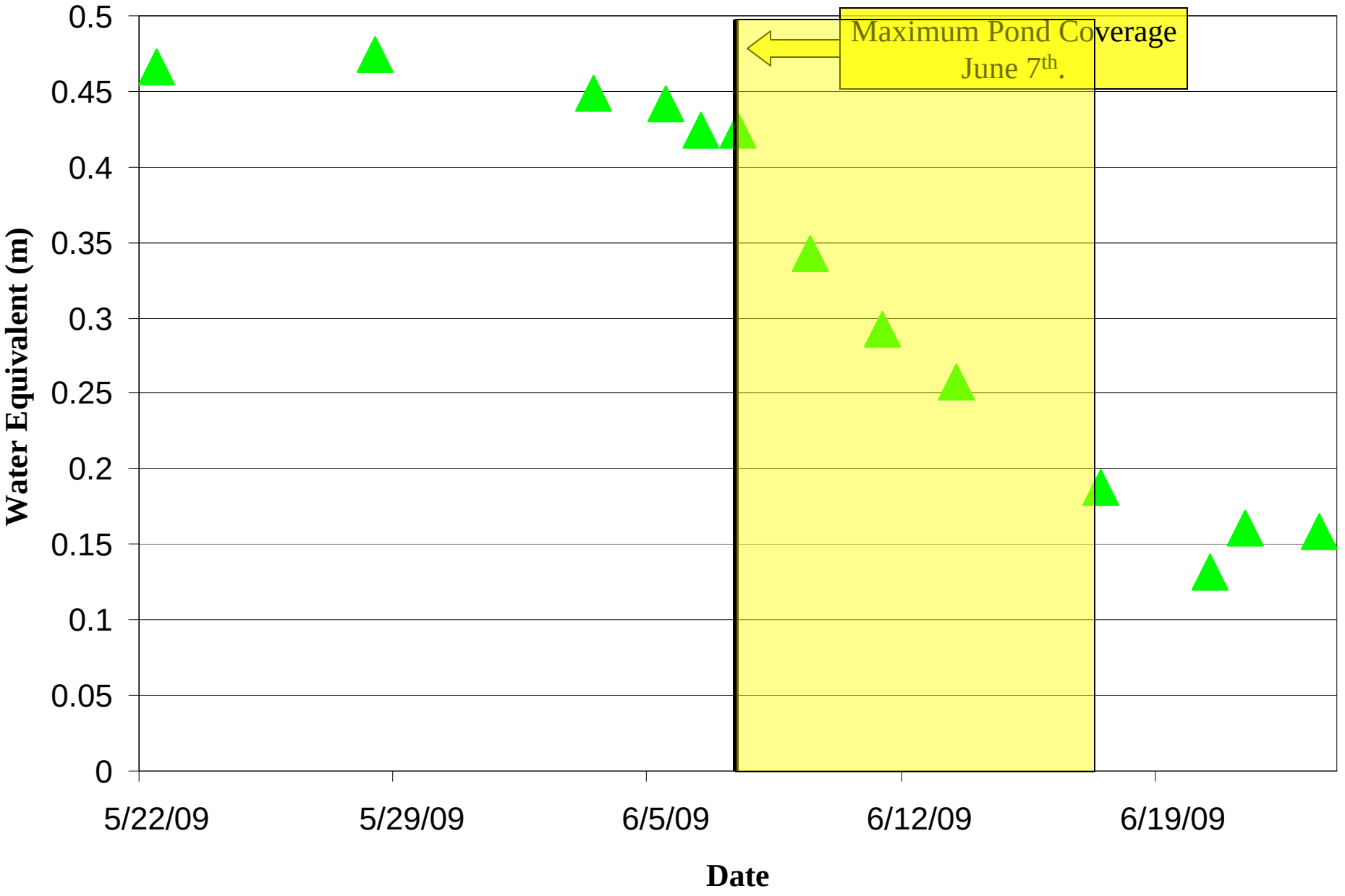
Meters of Water Equivalent Above Reference Plane, North Site



Meters of Water Equivalent Above Reference Plane, North Site



Meters of Water Equivalent Above Reference Plane, North Site



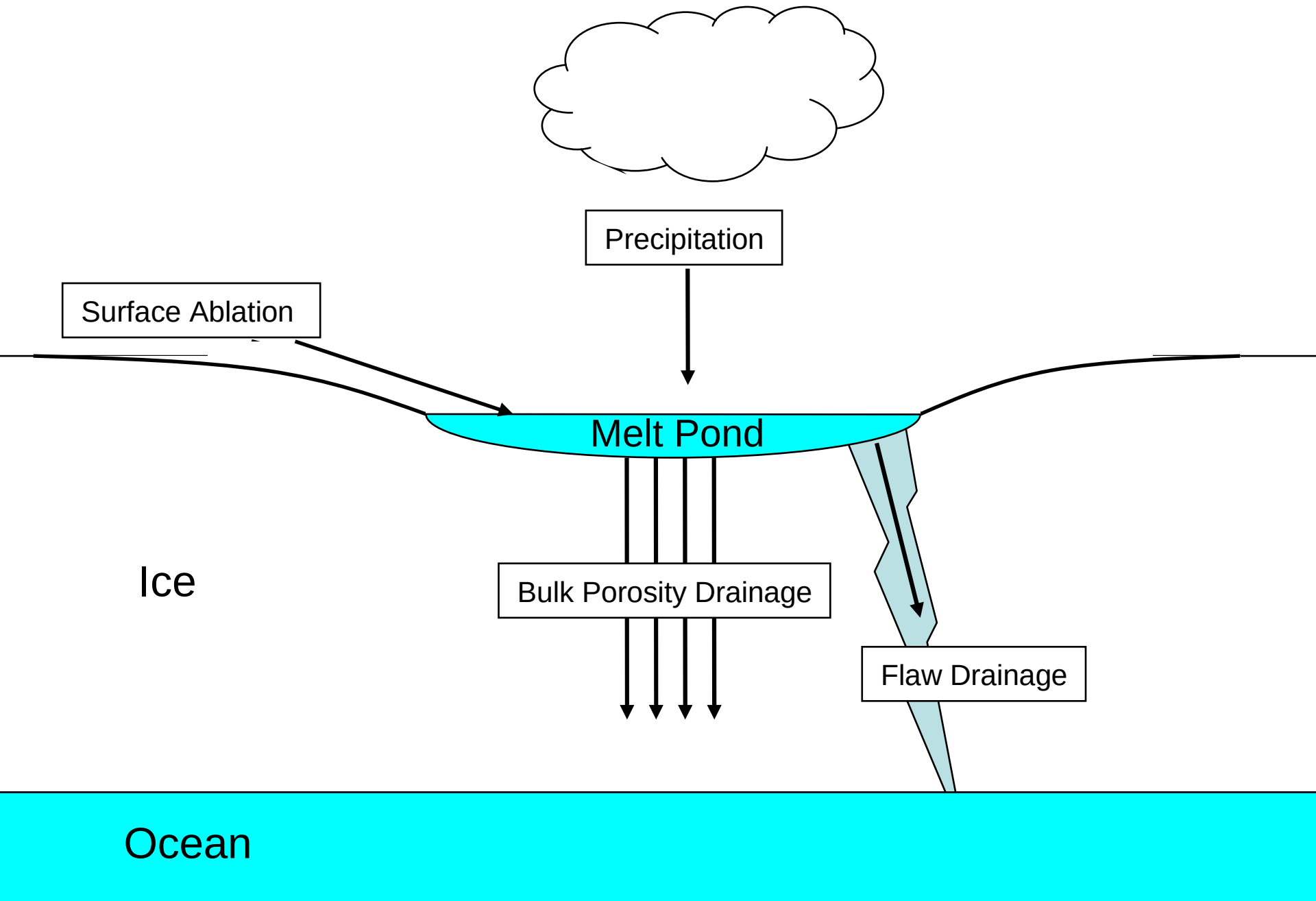
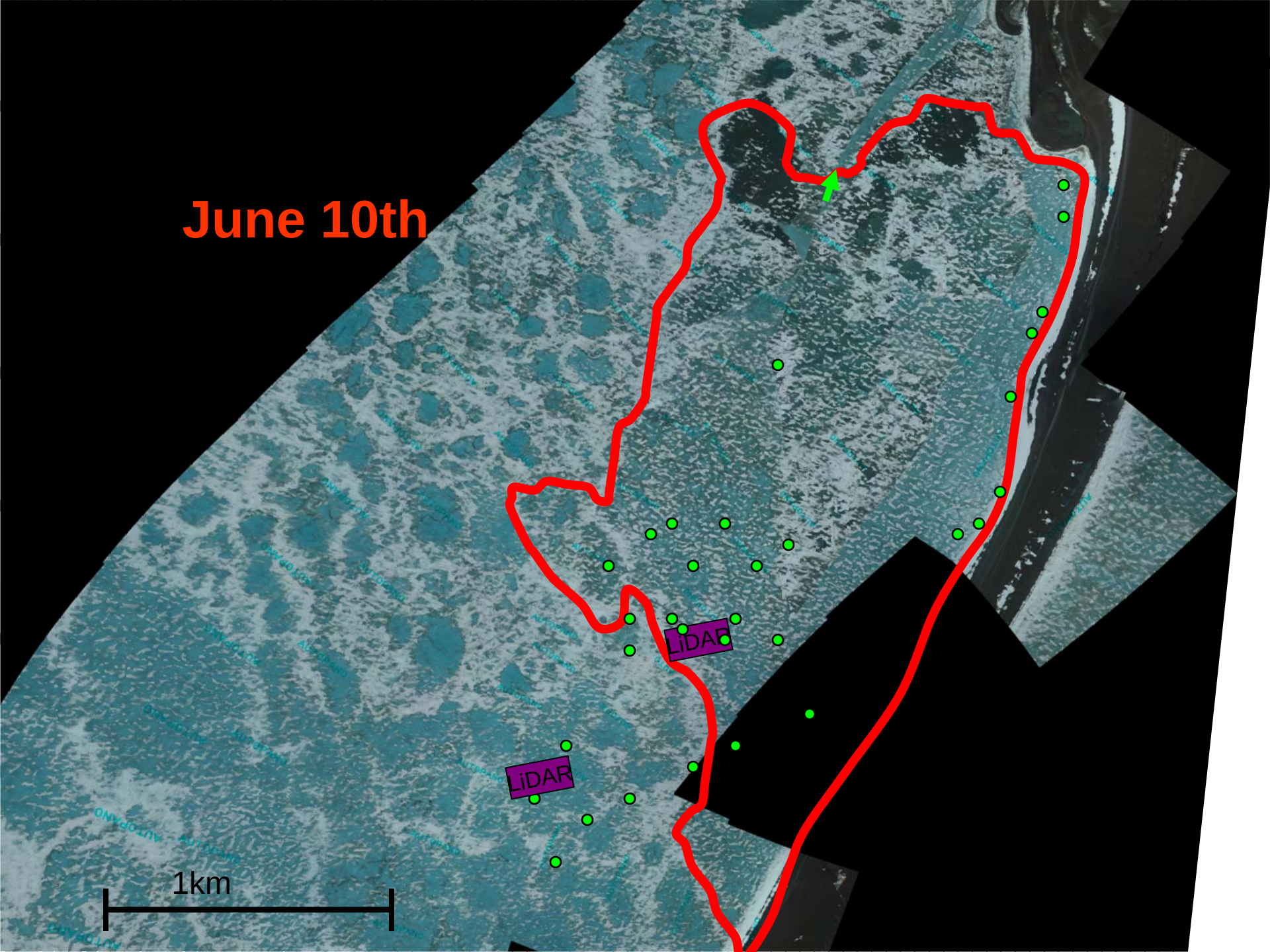
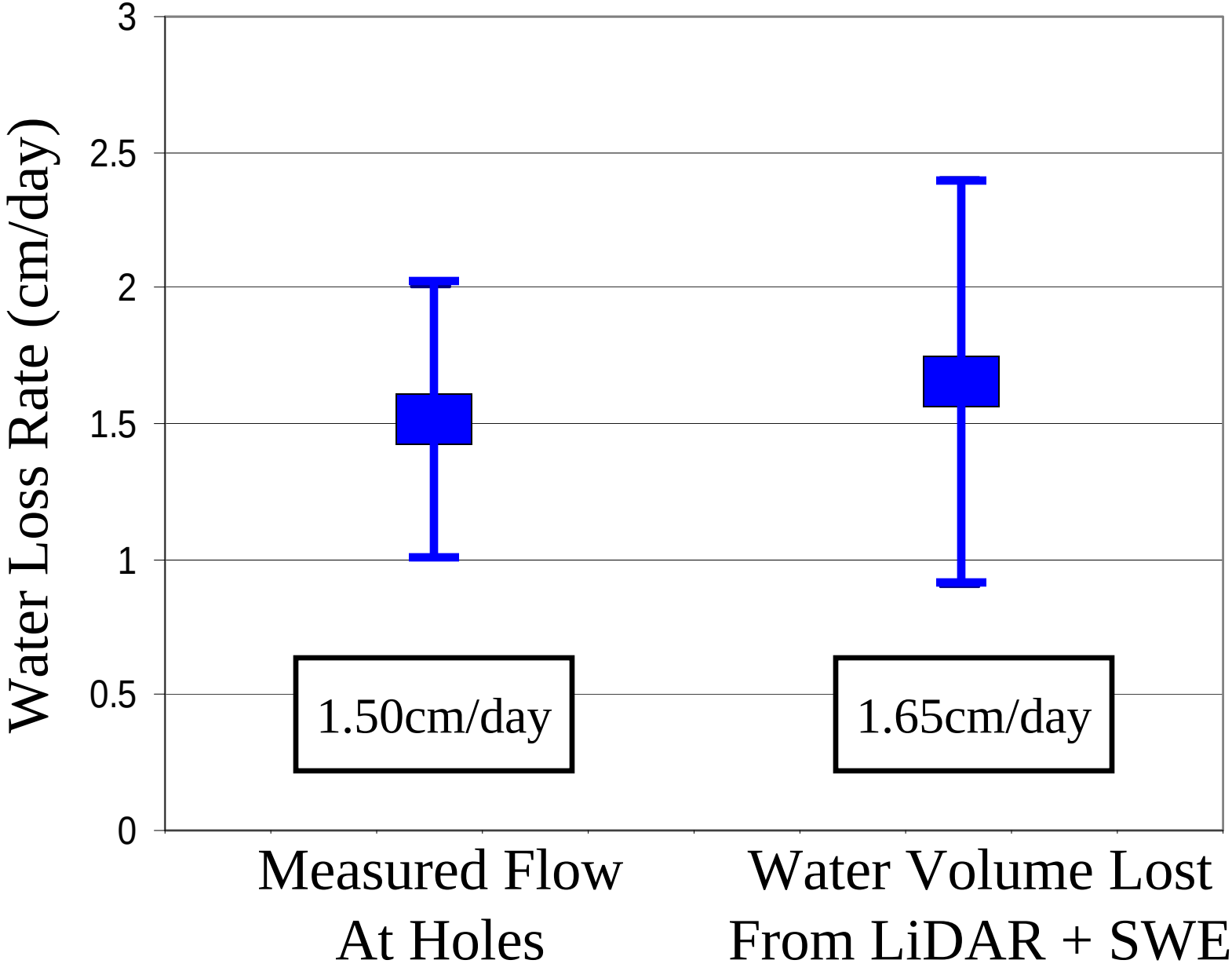

Precipitation
Surface Ablation
Melt Pond
Ice
Bulk Porosity Drainage
Flaw Drainage
Ocean

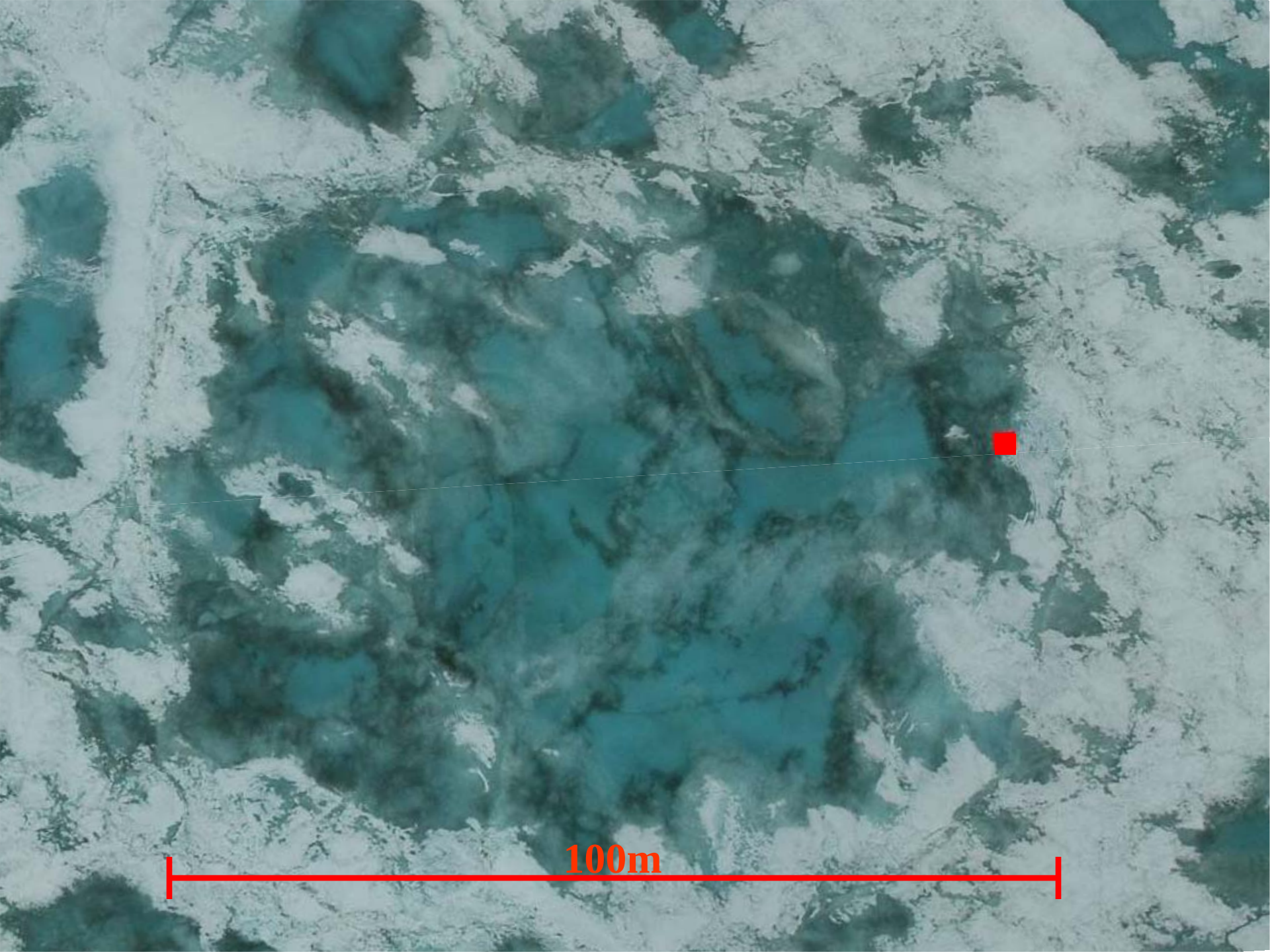
Photo: Chris Petrich

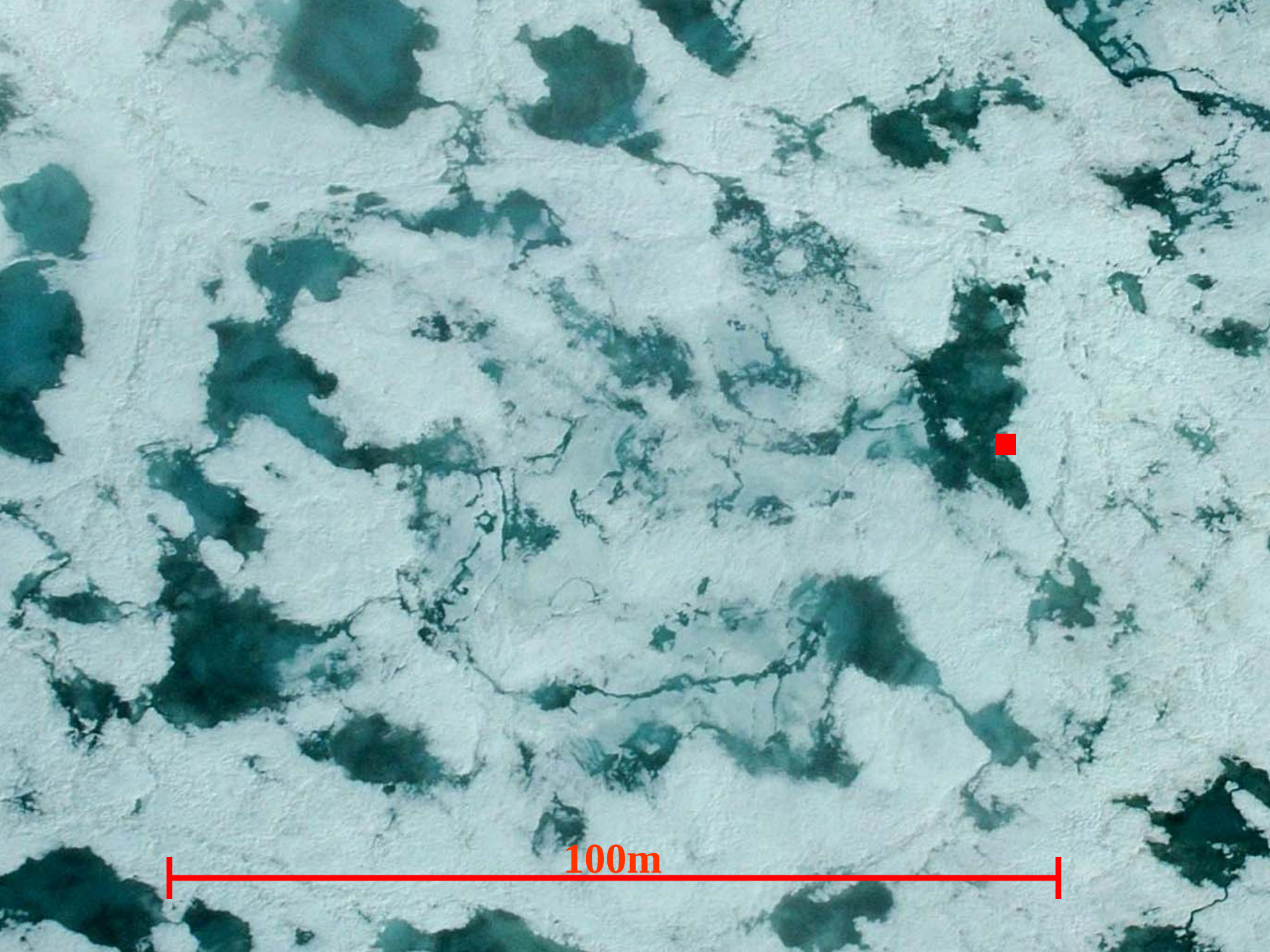

http://www.alaska-in-pictures.com/picture-of-a-harbor-seal-9057-pictures.htm

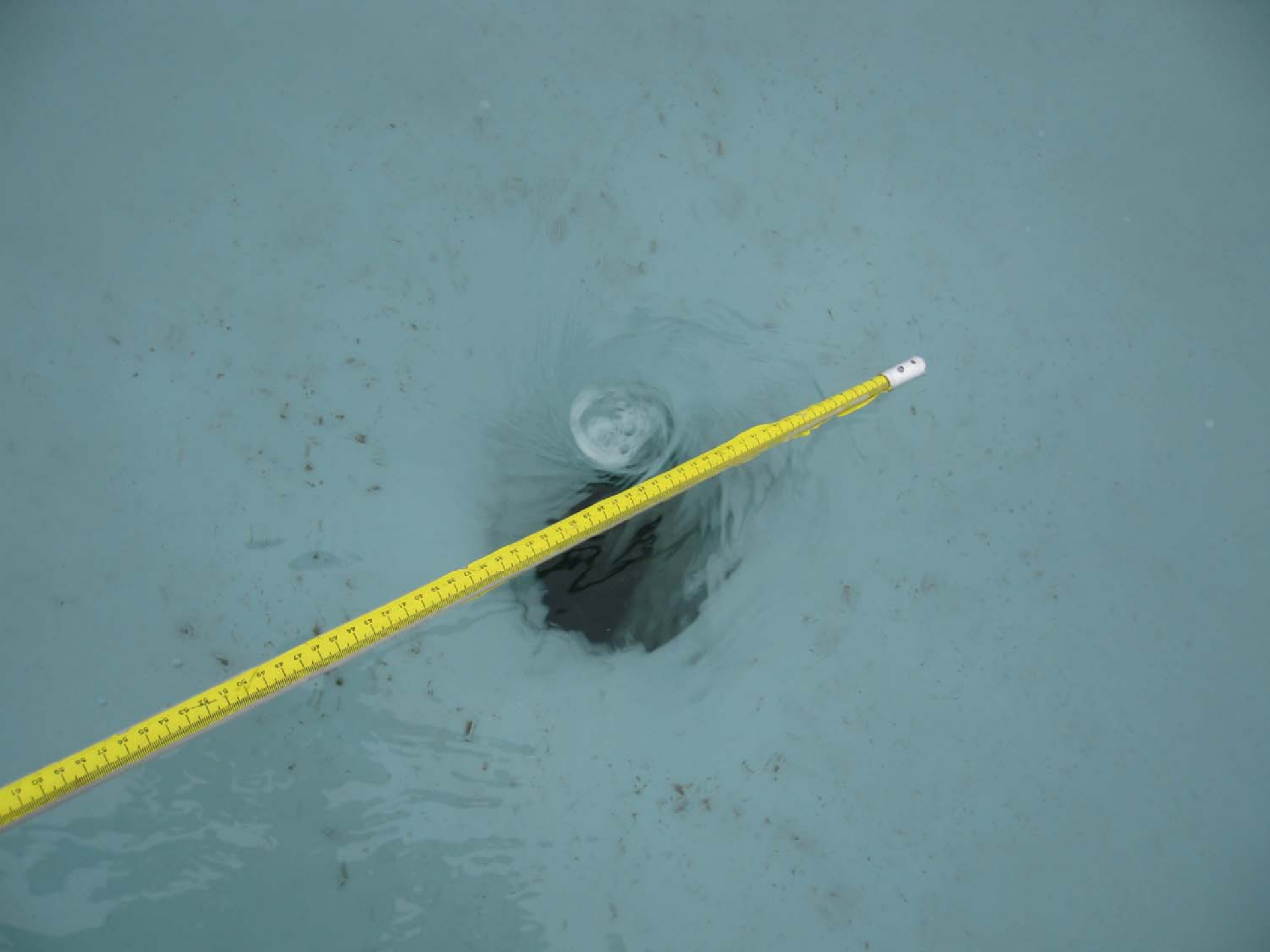

June 10th
LiDAR
LiDAR
1km

Water Loss Rate – June 10th

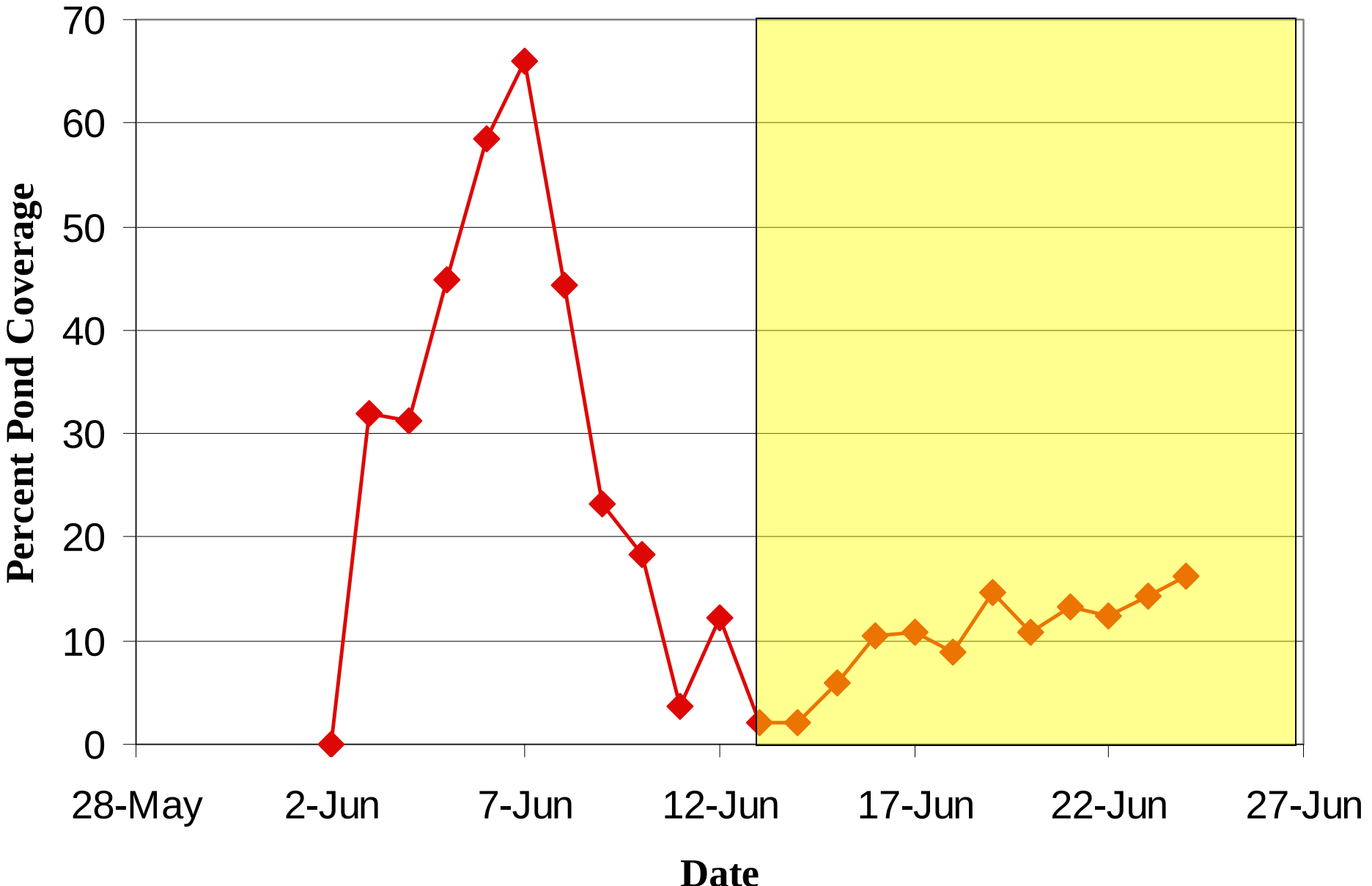


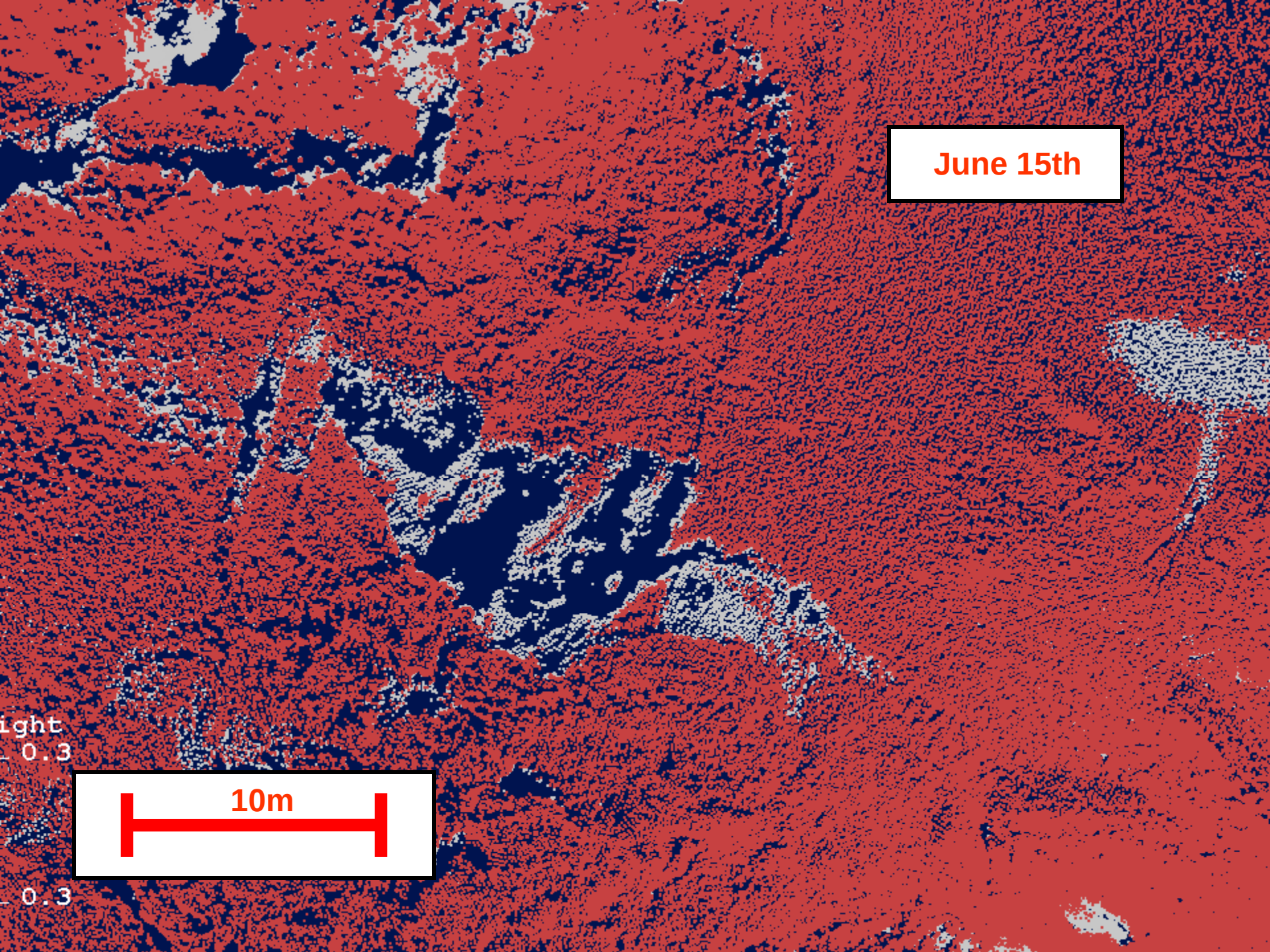

100m

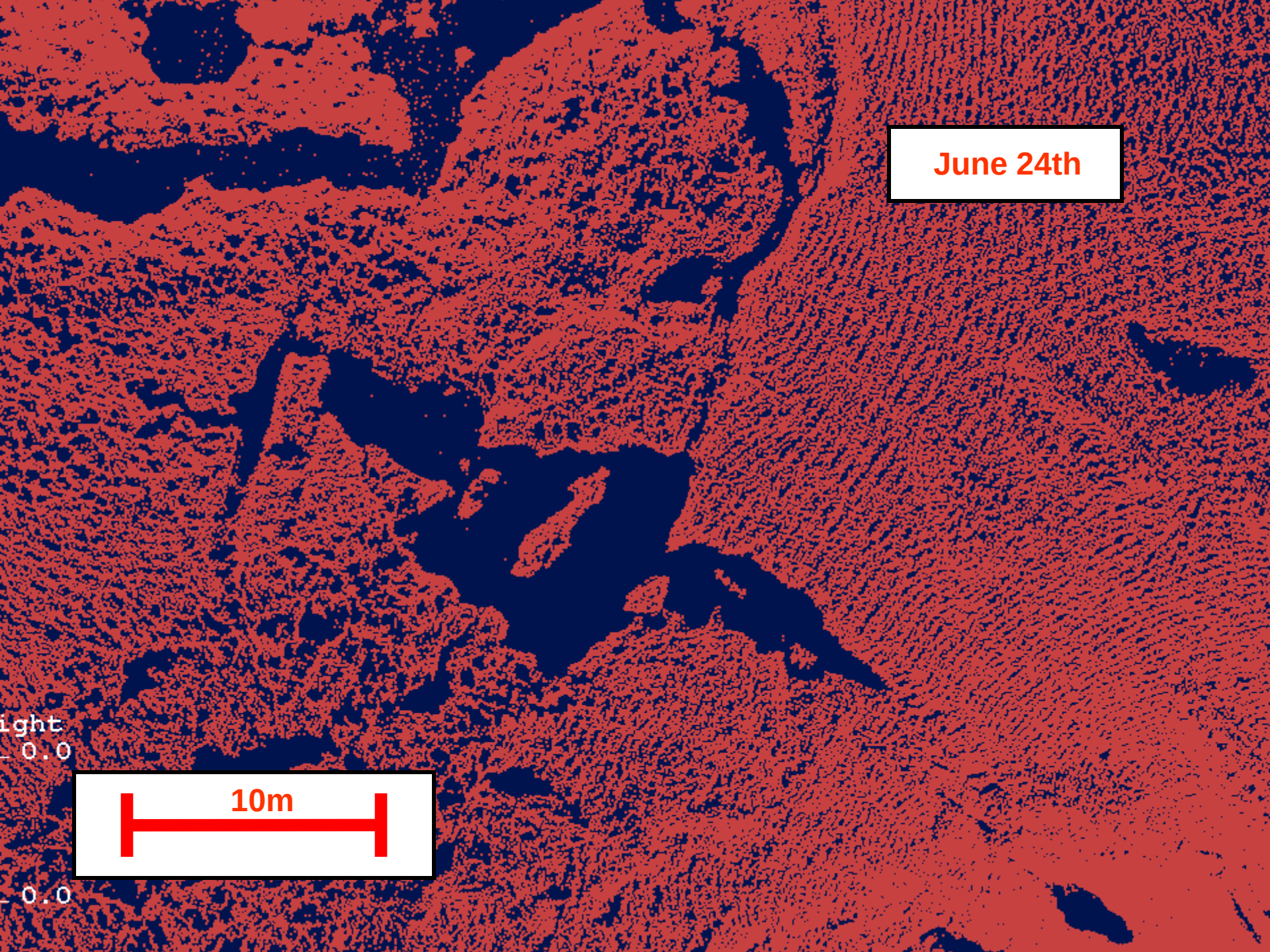

100m

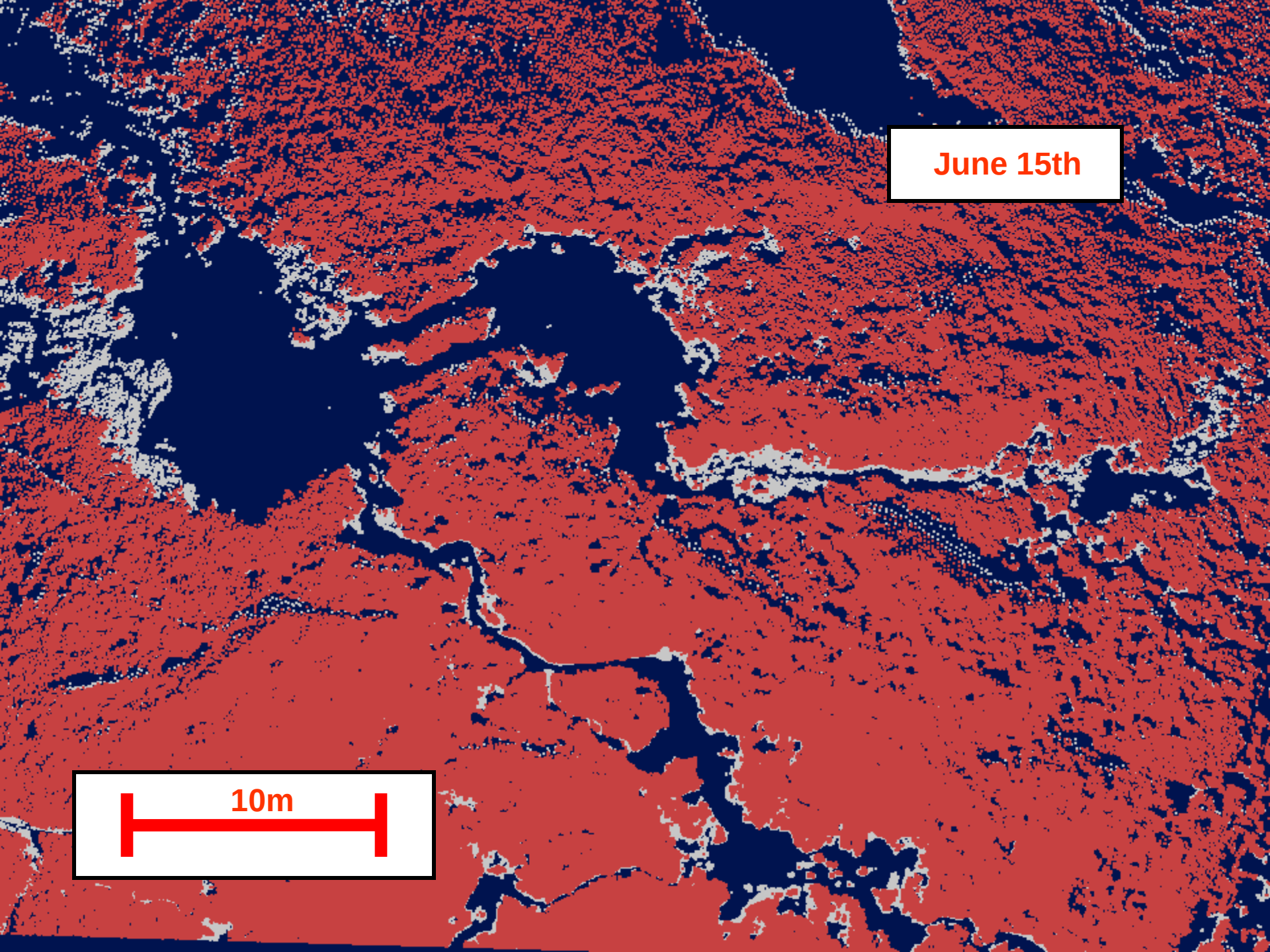


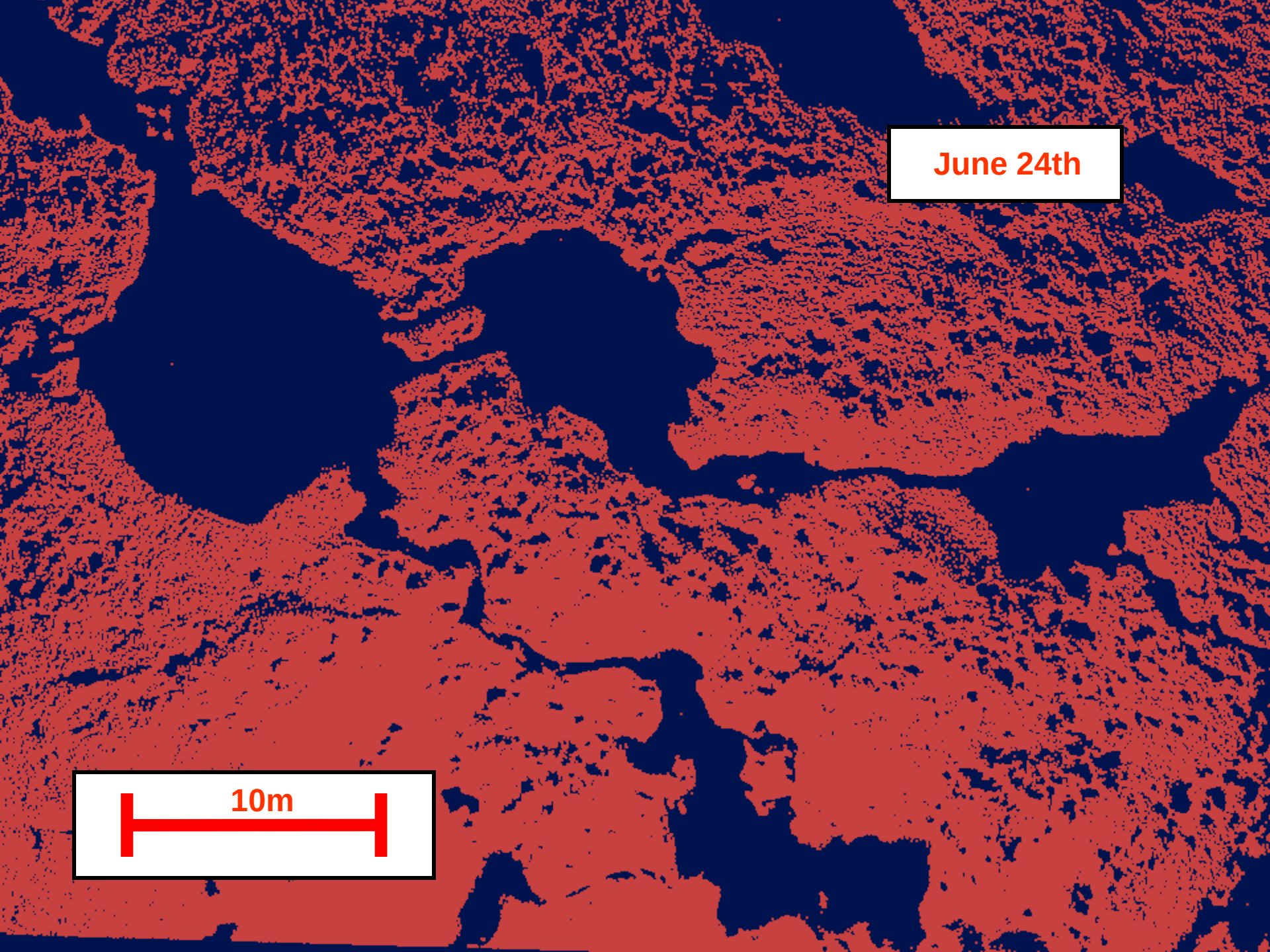
Melt Pond Coverage, South Site




June 15th
10m
ight
0.3
0.3


June 24th
10m


June 15th
10m


June 24th
10m

Conclusions

- Early Season Melt Ponds
  - Near 100% melt water retention
- Key Transition
  - At the point that brine channels become connective
- Melt Pond Drainage
  - Occurs through horizontal, over ice transport to macroscopic holes created by widening brine drainage channels
- Later Season Evolution
  - Forced predominantly by freeboard loss

Thank You

Collaborators

Zoe Courville, Don Perovich, Dave Finnegan, Matthew Sturm, Matthew Druckenmiller, Hajo Eicken, Chris Petrich

Barrow Arctic Science Consortium

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