

Jöklarannsóknir

Jöklahópur, Jarðvísindastofnun Háskólans:

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Tómas Jóhannesson, Veðurstofa Íslands

Hrafnhildur Hannesdóttir, doktorsnemi, Jarðvísindadeild Háskólans

Í samstarfi við og með stuðningi frá:

Landsvirkjun

Vegagerðin

Rannís

Rannsóknasjóður Háskólans

Sjóður Eggerts V. Briem

Orkuveita Reykjavíkur

Evrópusambandið (Temba, Icemass, Spice projects)

Alþingi

Kvískerjasjóður

Norræna Ráðherraráðið

Jöklarannsóknafélag Íslands

Spot Image

og margir aðrir



Jöklar þekja ~11% Íslands

4 stórir jöklar
13 minni
~ 200 smájöklar

Flatarmál: ~11,000 km²
Rúmmál: ~ 3600 km³

35 m jafndreift yfir landið
1 cm hækkun sjávarborðs

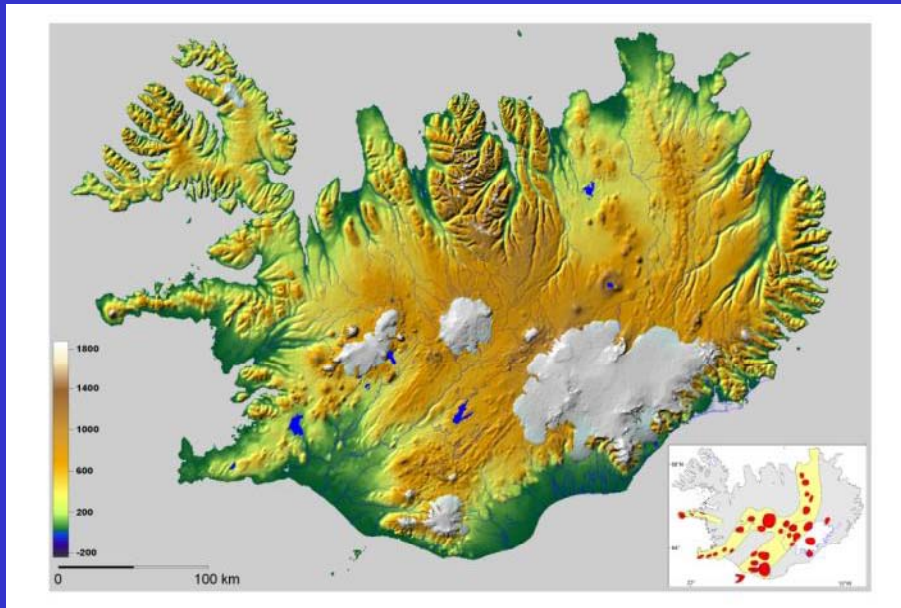
Ísforði: 20 föld ársúrcoma

Þíðjöklar

Hæðarspann : 0 – 2110 m

Jöklunarmörk: 600 – 1200 m

Elsti ís: ~800 ár (öskulagatímatil
Guðrún Larsen et al.)



Til jöklarannsókna þarf:

Söguleg gögn

Jöklajarðfræði upplýsingar

Lögun yfirborð

Lögun botns

Afkomu

Skriðhraða

Veðurgögn

Eðliseiginleikar íss

Fáguð (Analytic) og tölræn líkön

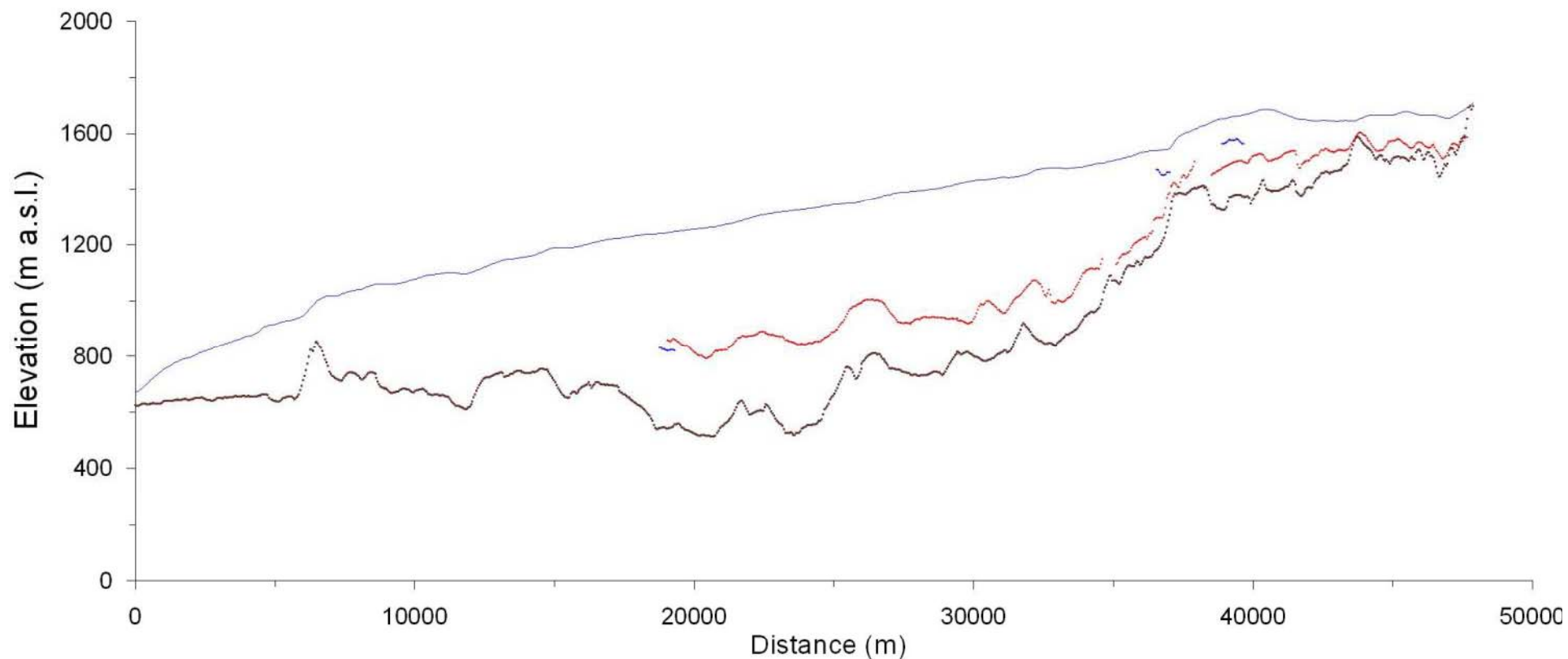
Lögun botns og yfirborðs mæld:

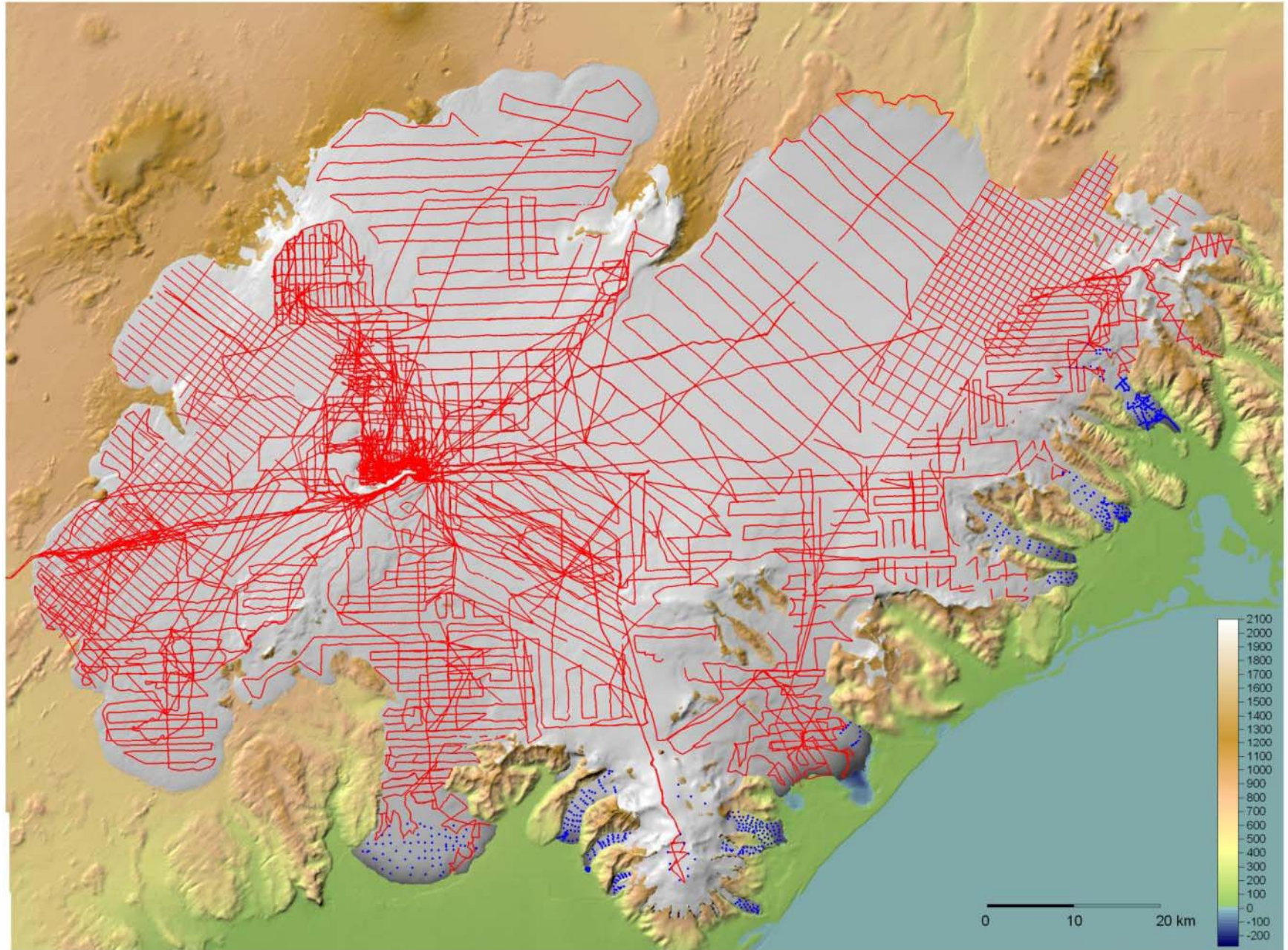
-Jökulyfirborð:

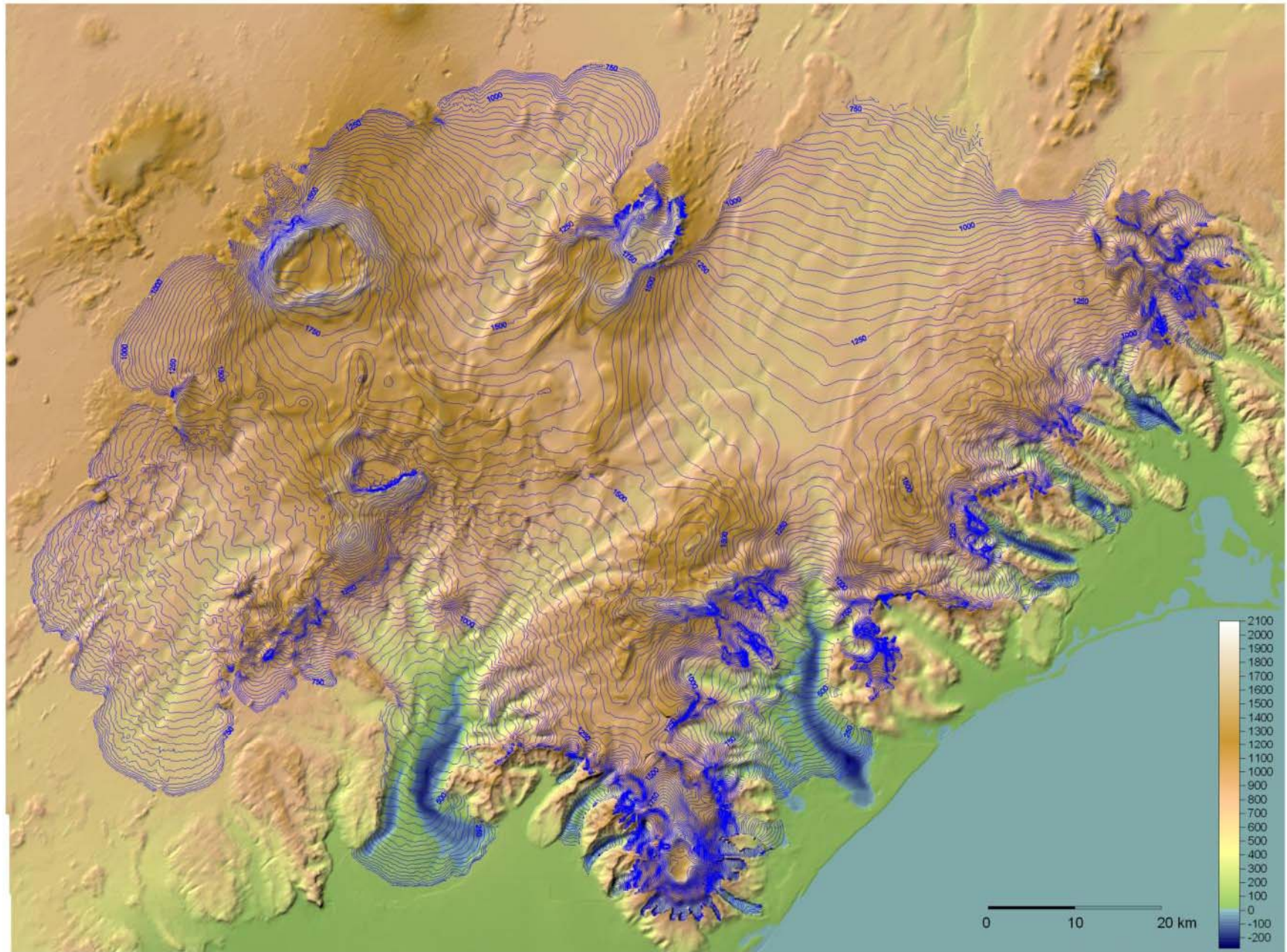
Nákvæmnisloftvog, GPS, gervitunglamyndir, LIDAR

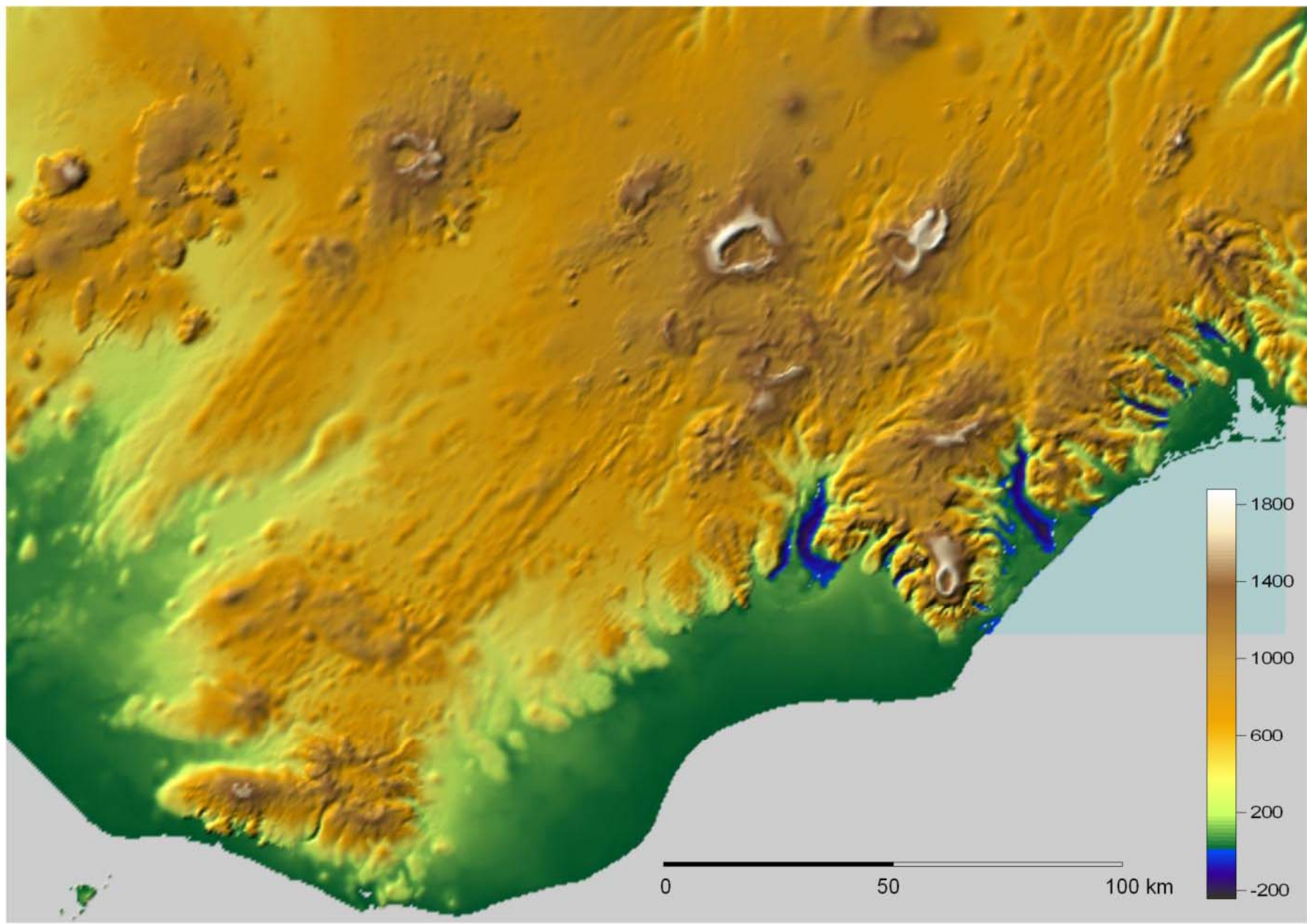
-Jökulbotn:

Íssjá (Radar)





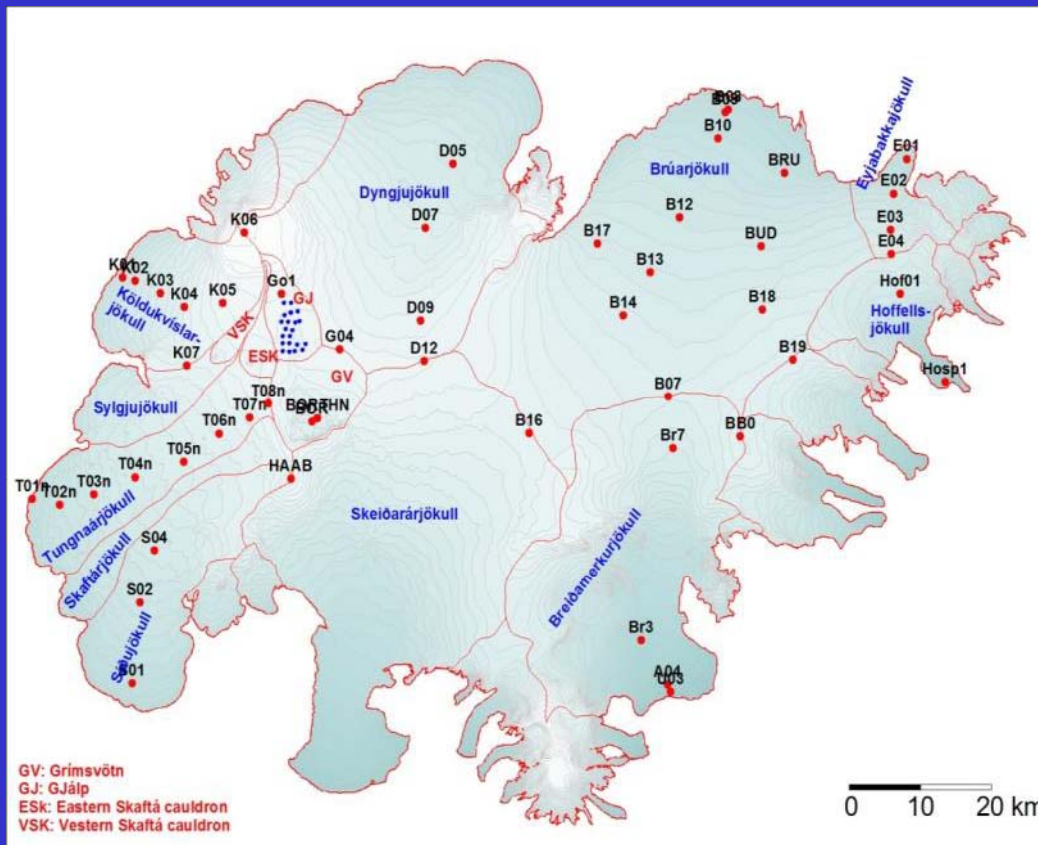




Afkomumælingar

(jökulár: 1. október – 30. september)

Afkomumælistaðir á Vatnajökli



- **Vetrarafkom:**

Ískjarni boraður gegnum vetrarsnjóinn:

Eðlismassi mældur

- **Sumarafkoma:**

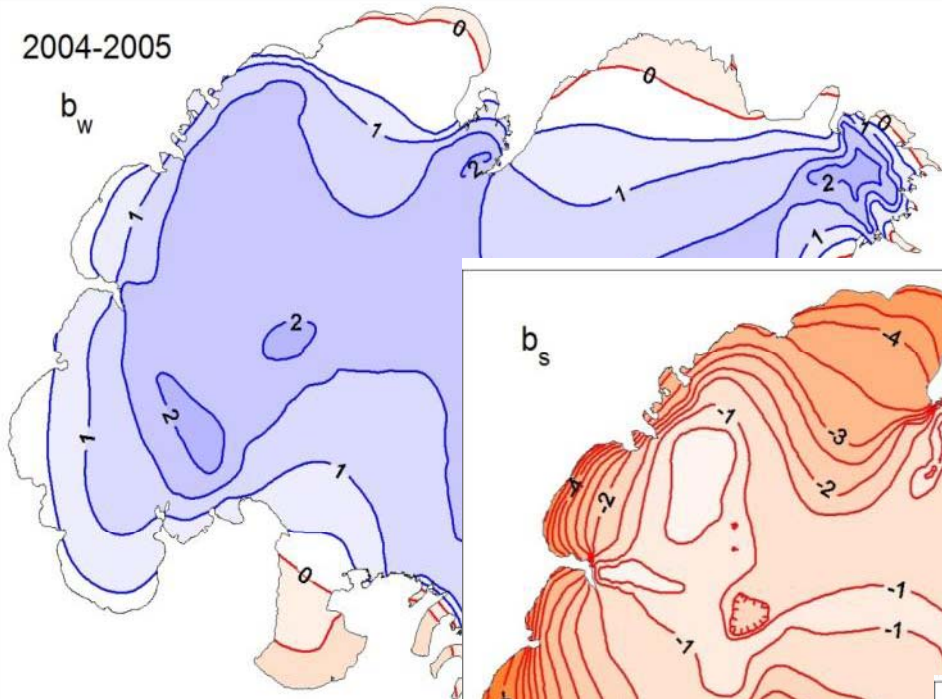
Stikur settar í kjarnaholur (vírar í ísinn á leysingasvæði). Mælt hve langt stika/vír er uppúr vor og haust.



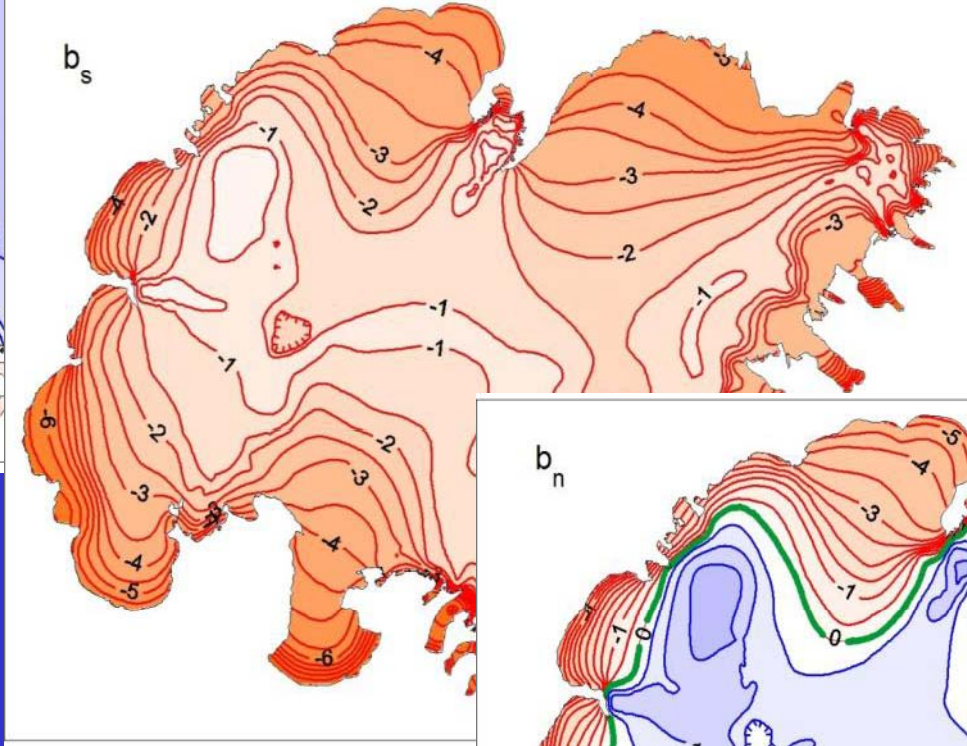
2002/01/08

2004-2005

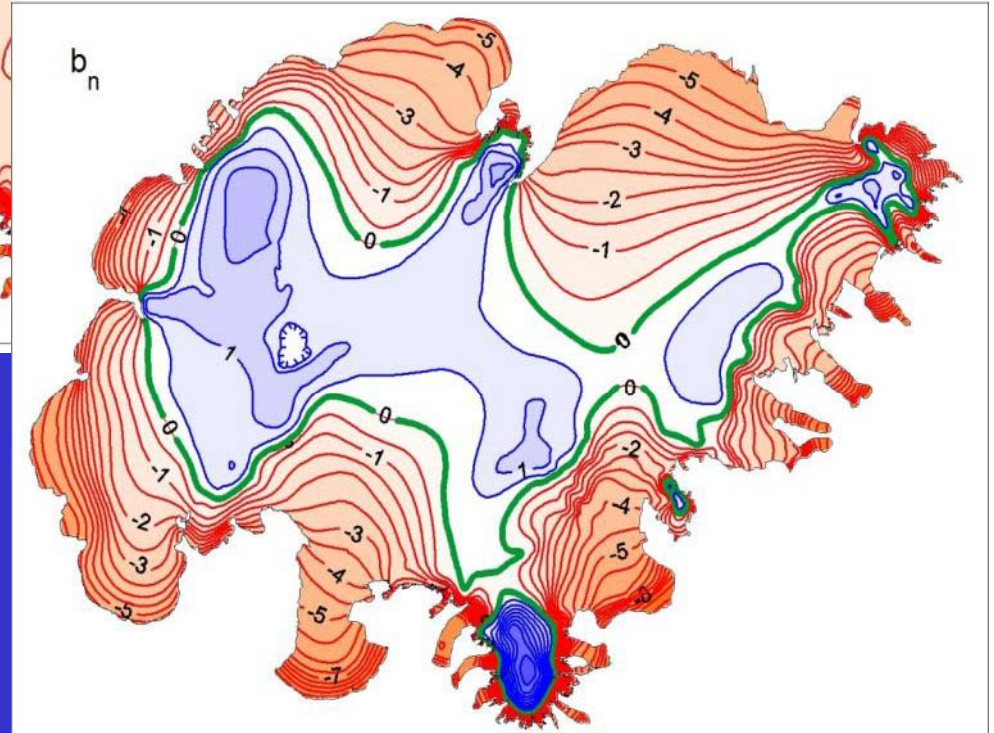
b_w



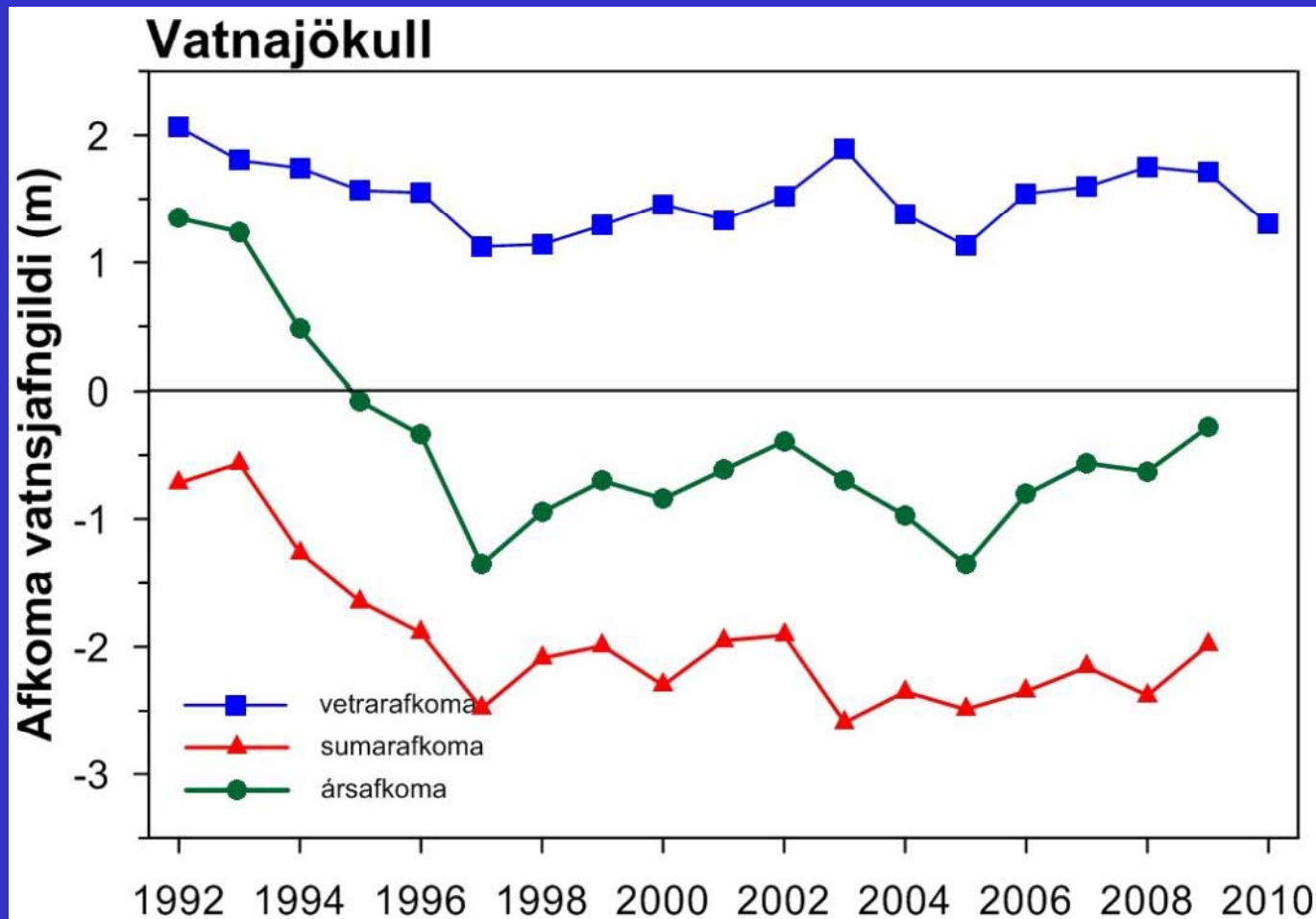
b_s



b_n



Afkoma Vatnajökuls 1991_92 - 2008_09



Massatap síðan 1994_95: 95 km³ of 3100 km³ eða 3.1%

Massatap 1890: ~400 km³ eða ~11%;

~1 mm hækkun heimshafanna!

Jöklasagan rakin:

Jöklajarðfræði

Sögulegar heimildir

Stafræn líkön afkomu og hreyfingar

Mismunur yfirborðshæðarlíkana (DEM):

Hæðarlíkön gerð eftir:

Eldri útgefin kort

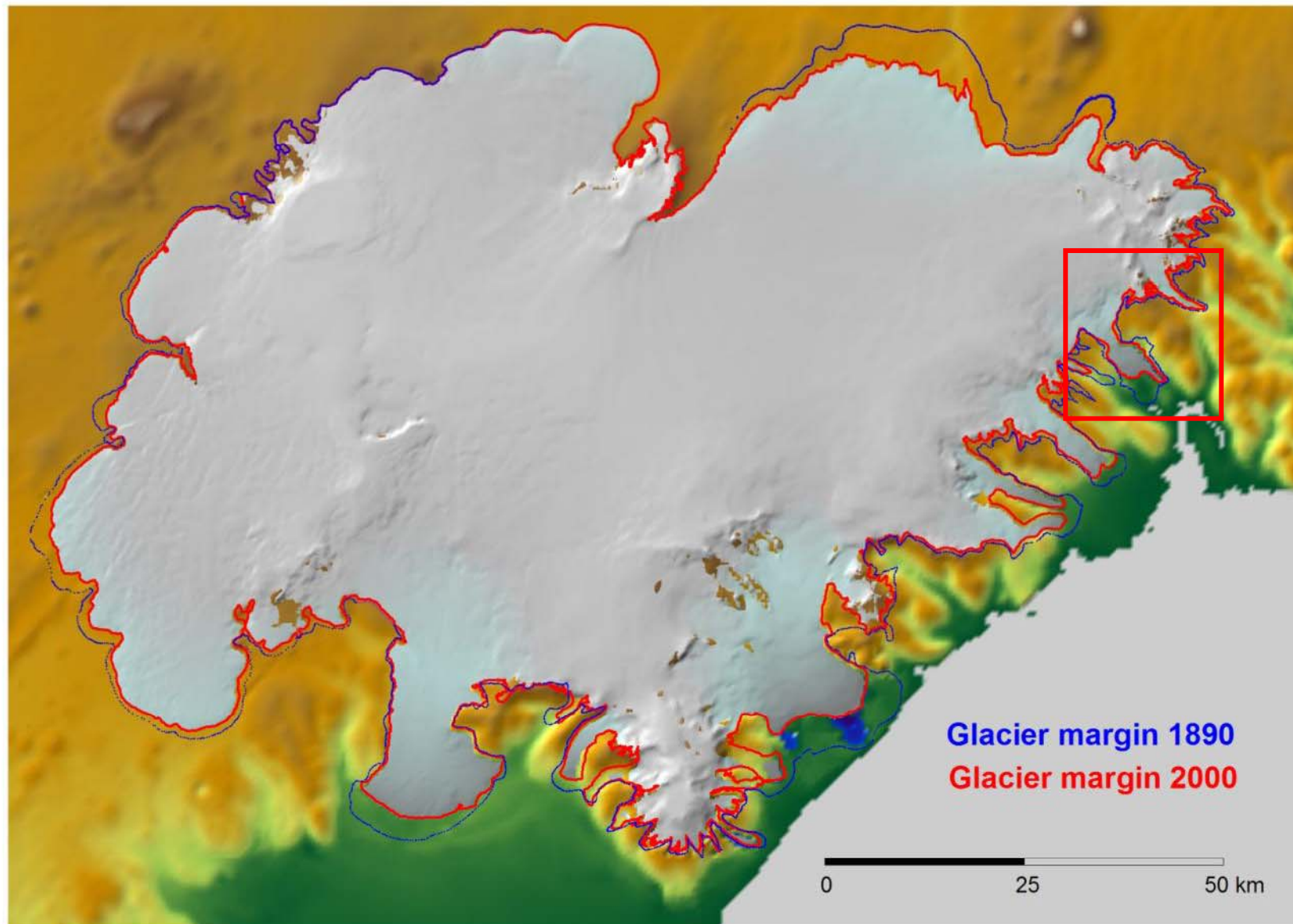
Flugmyndir

Yfirborðssnið

Gervitunglamyndir

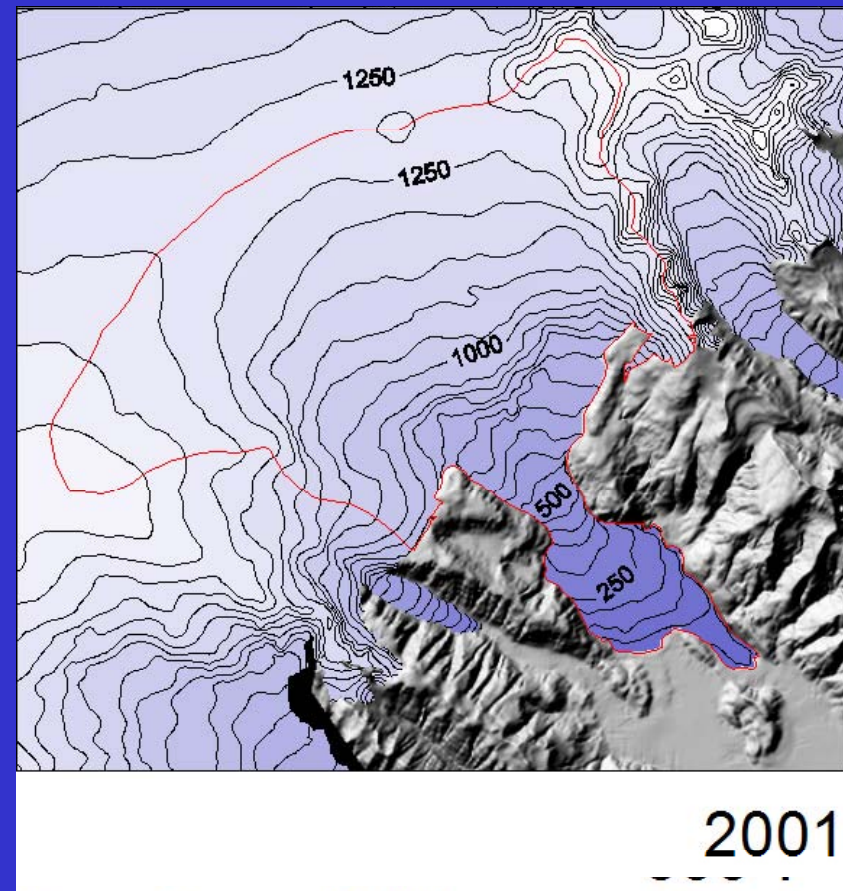
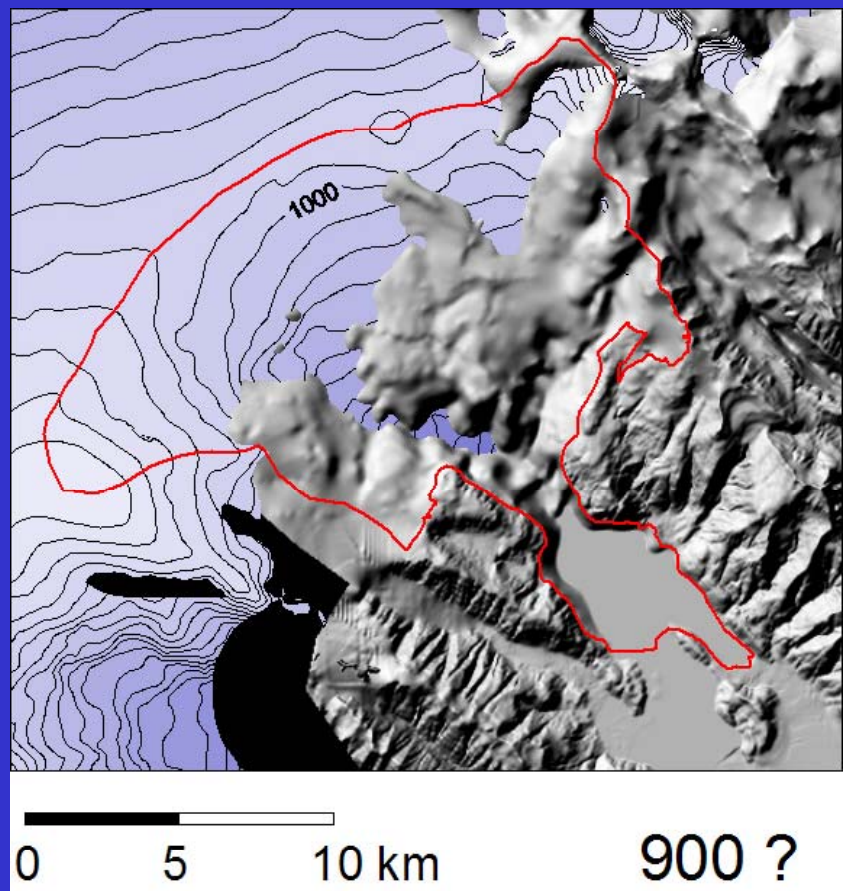
Leysi hæðarmælingar úr flugvél

Saga nútíma jökla rakin:



Þróun Hoffellsjökull á sögulegum tíma

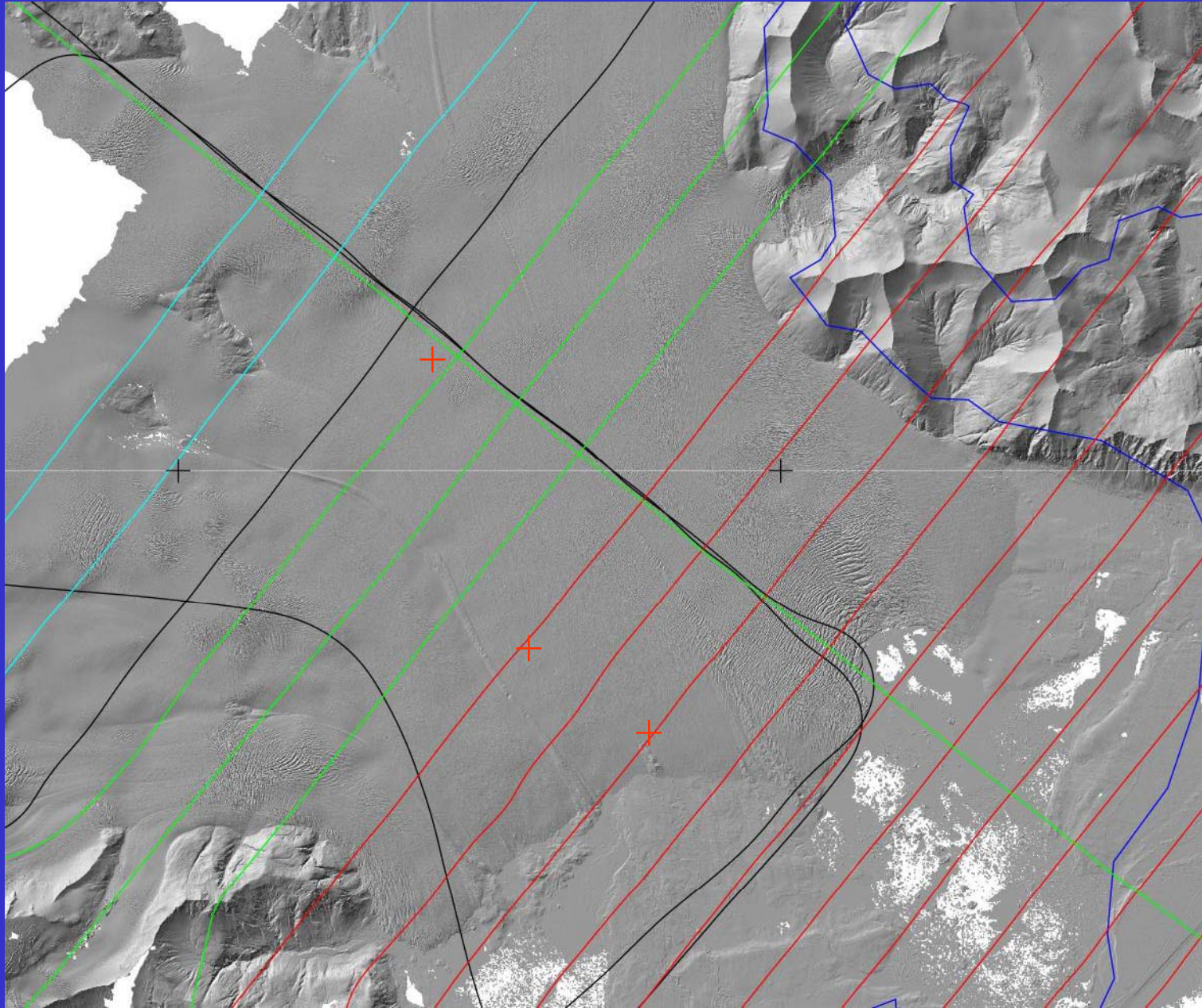
Eftir rituðum frásögnum, munnmælum og kortum á síðari tímum:





Jökulyfirborð mælt með leysihæðarmæli úr flugvél.
Braut flugvélar mæld með landmælinga GPS tækjum.
Hæðarnákvæmni ~tugur sm.
Flatarupplausn háð, flughæð; ~1 m.

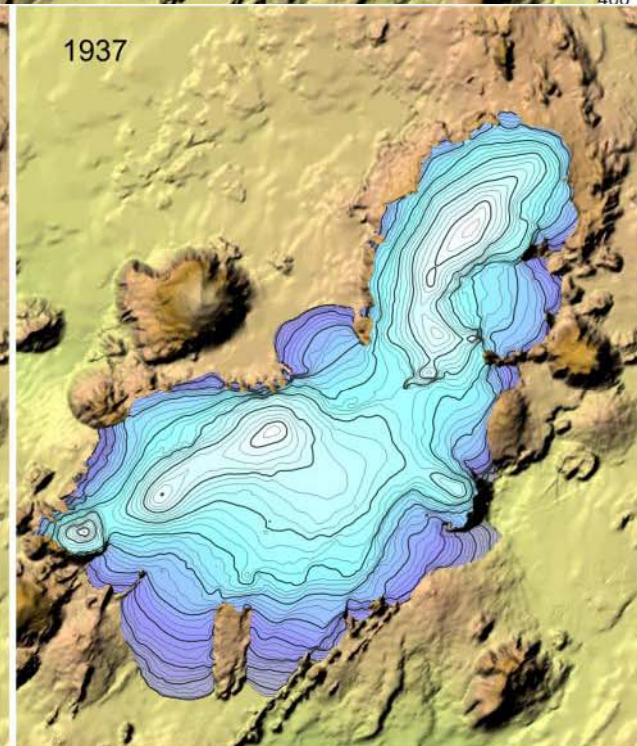
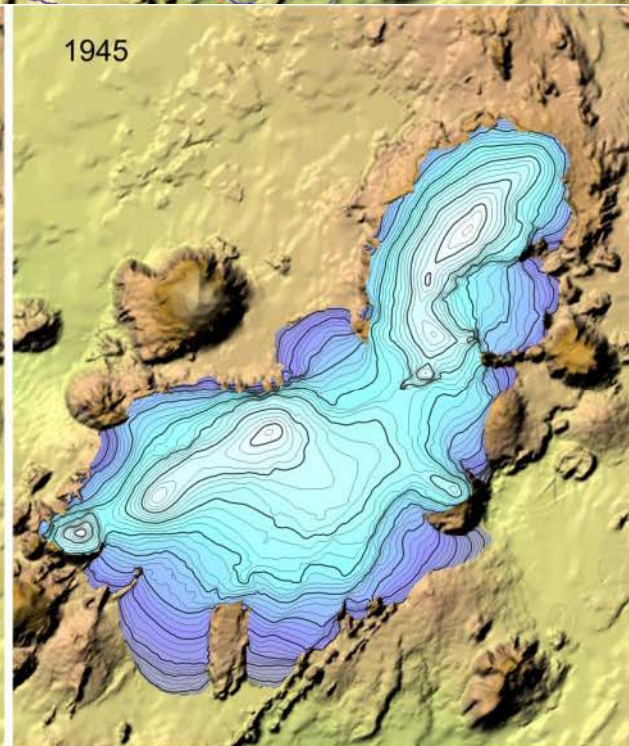
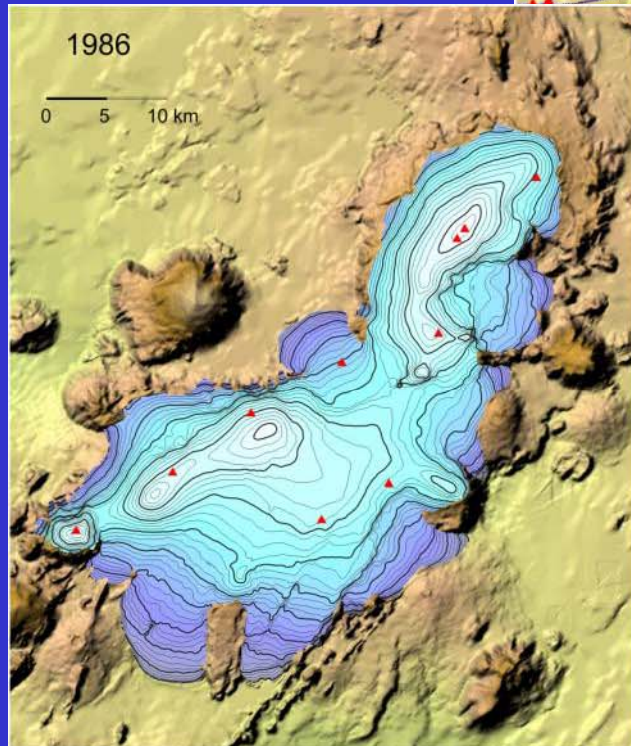
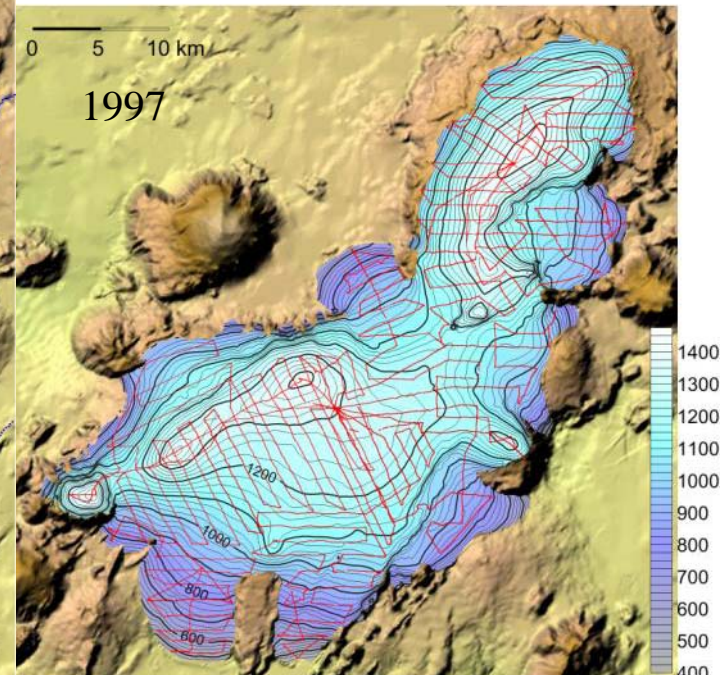
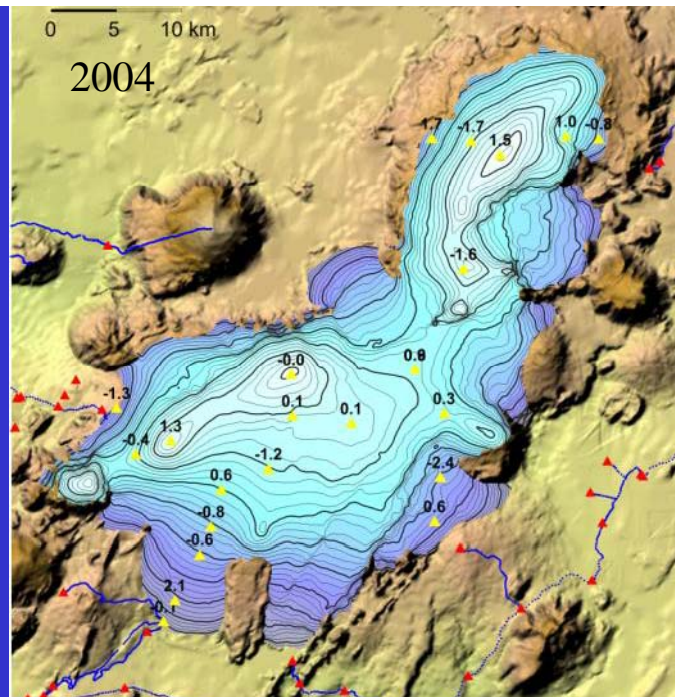
Breiðamerkurjökull

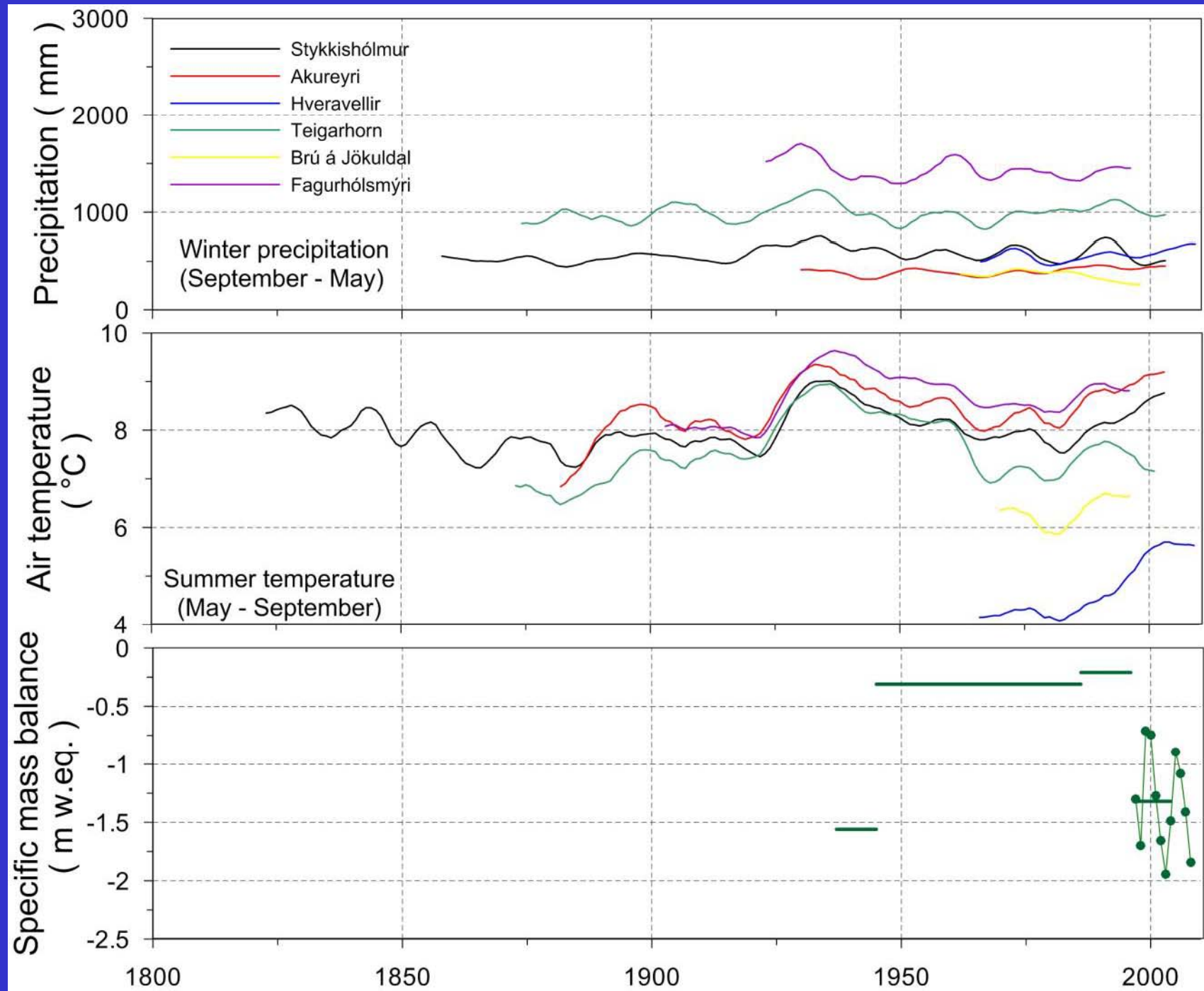


Langjökull (900 km²)

Ýmis hæðarlíkön

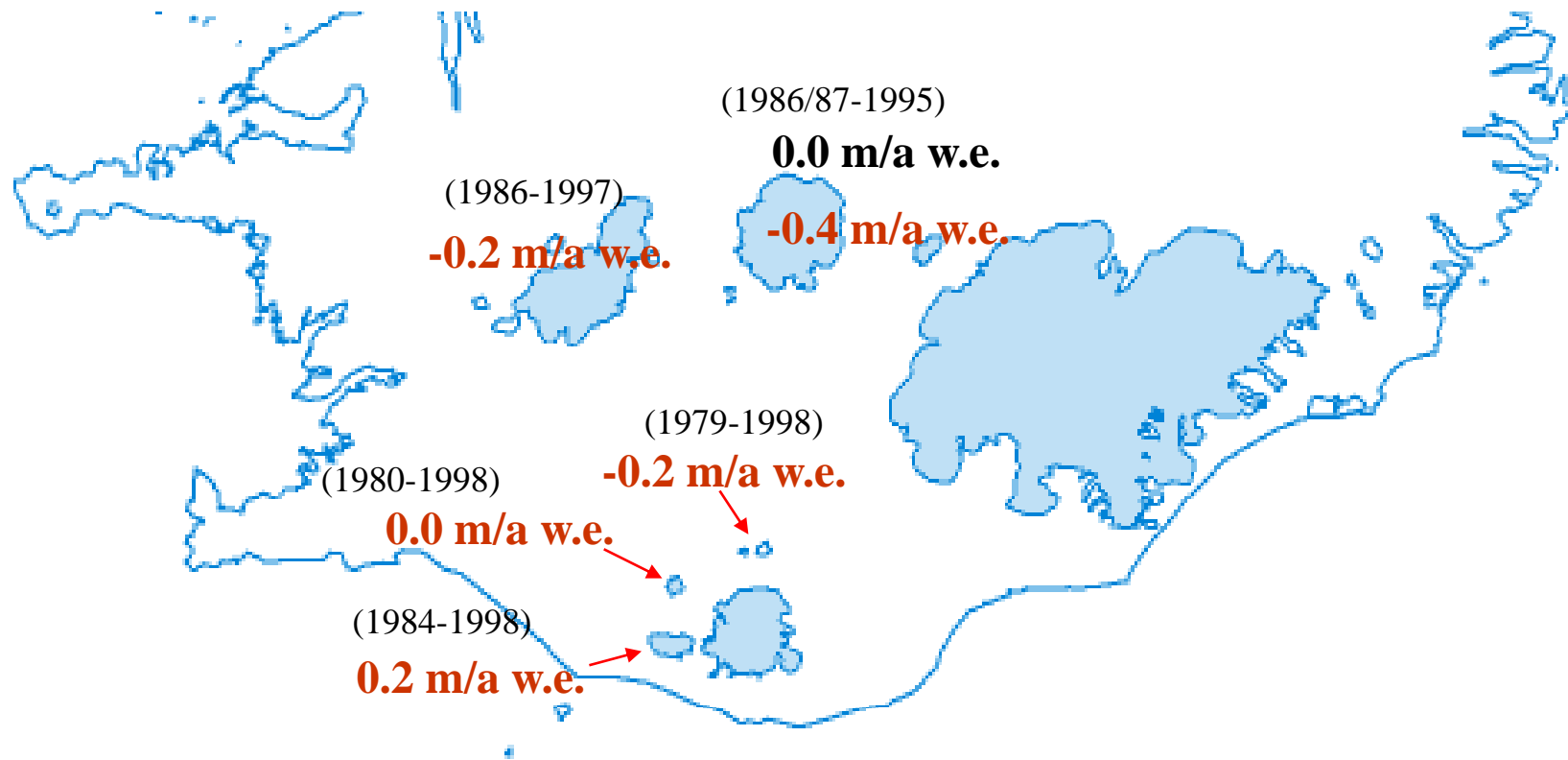
1937 - 2004





Specific mass balance in the 1980s to 1990s:

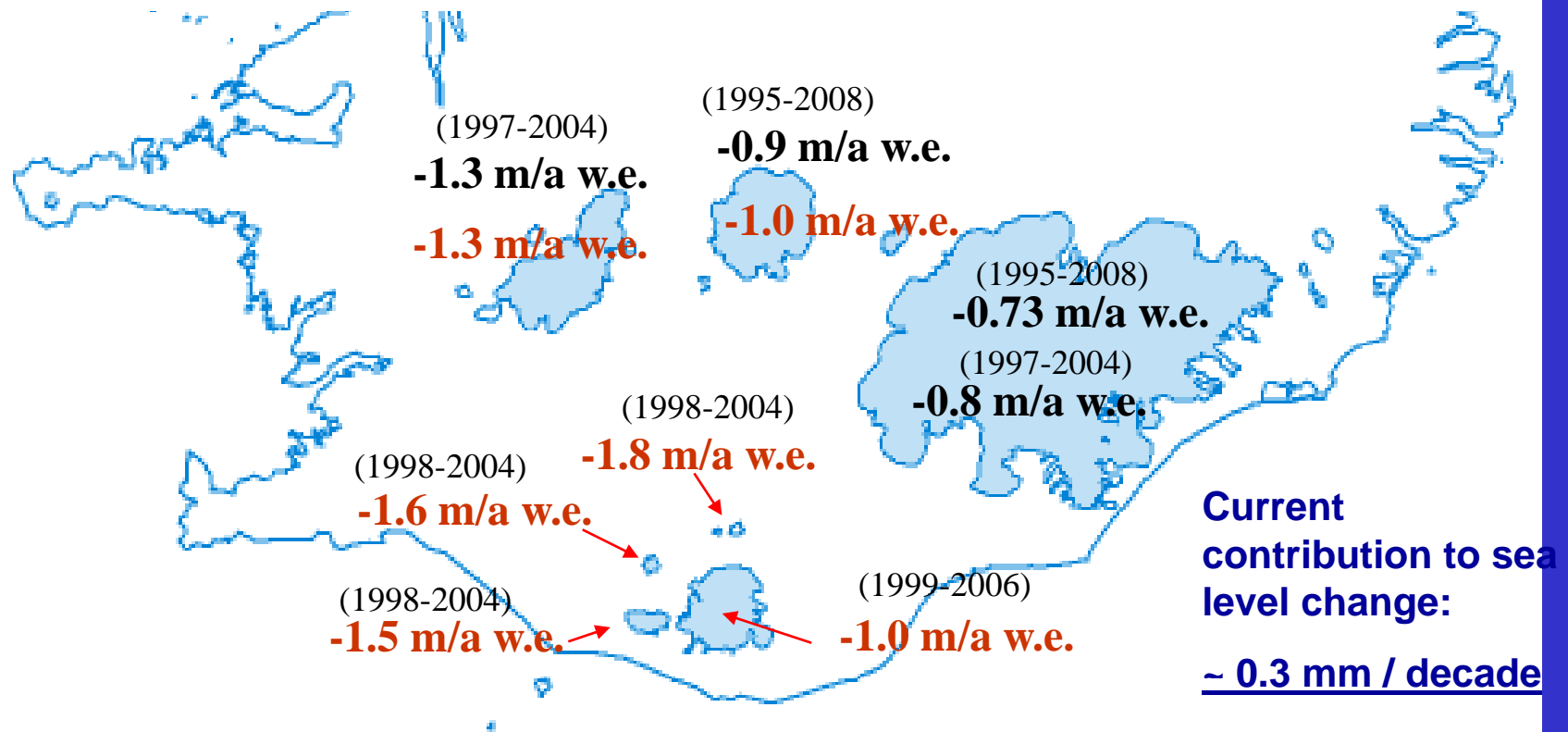
- **Black**: from the *in-situ* observations:
0.0 m/a w.eq. for Hofsjökull 1987 to 1995
- **Red**: from the differential DEMs:
near balance (close to zero)



Specific mass balance during the past 10 to 15 years

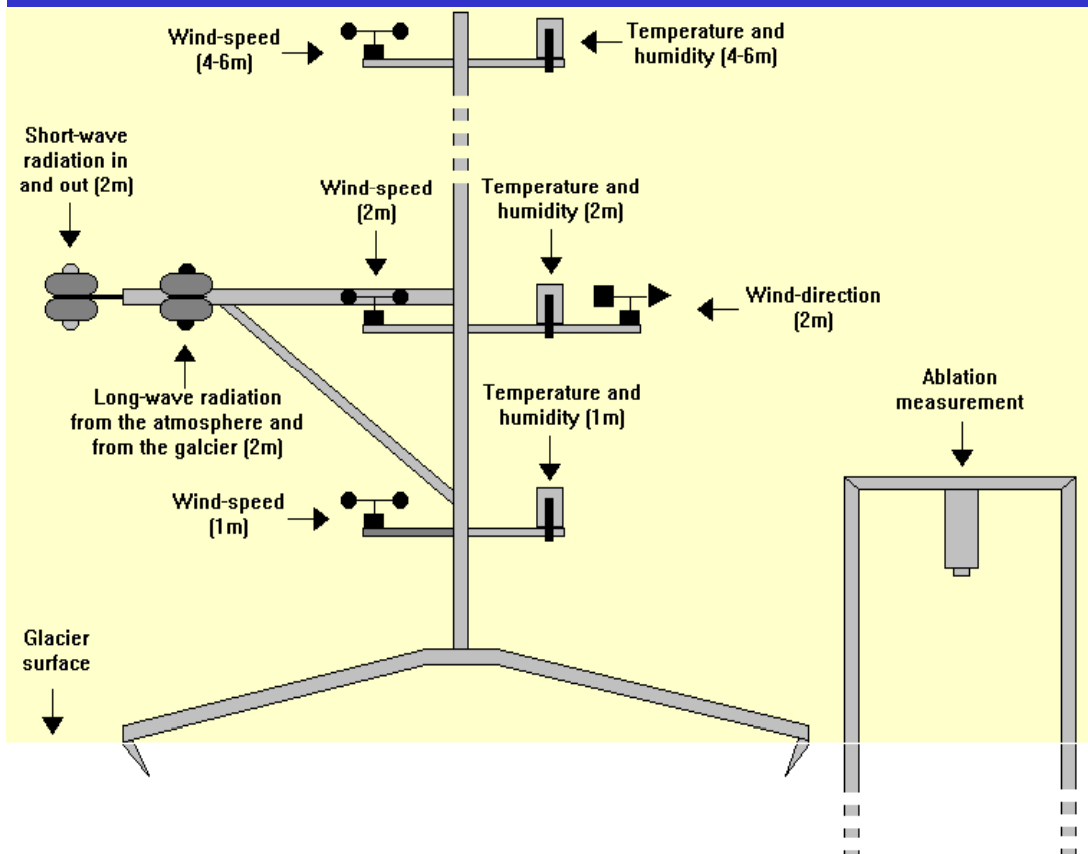
- **Black:** from the *in-situ* observations:
-1.3 to -0.9 m/a w.eq.

- **Red:** from the differential DEMs:
-1.8 to -1.0 m/a w.eq.



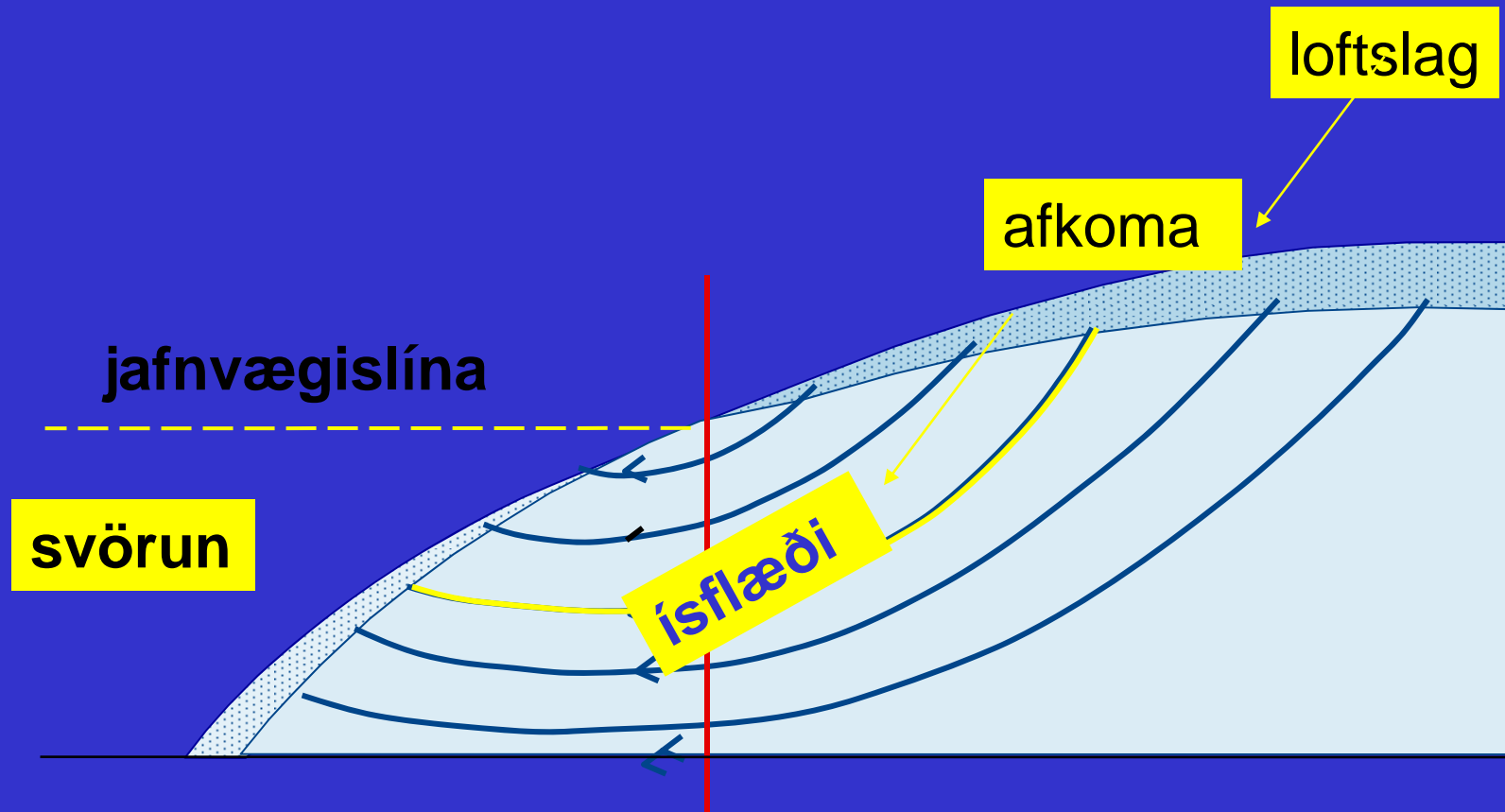
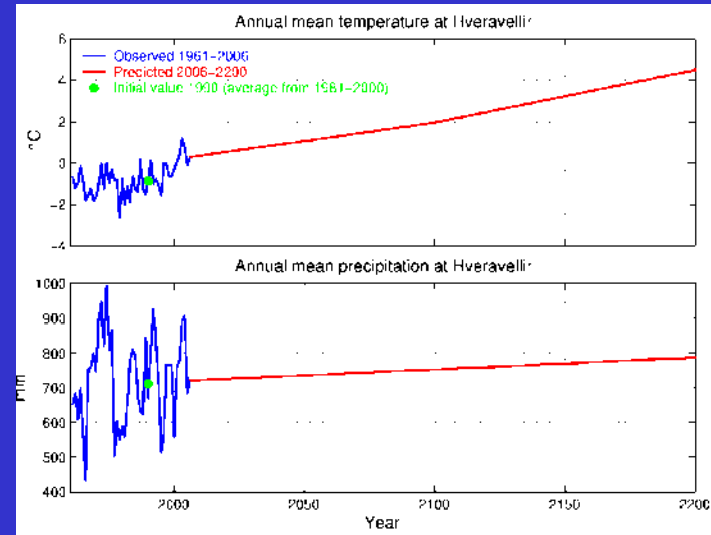
Af hverju bráðnar ís og snjór, hvaðan kemur orkan ?

Sjálfvirkar veðurstöð

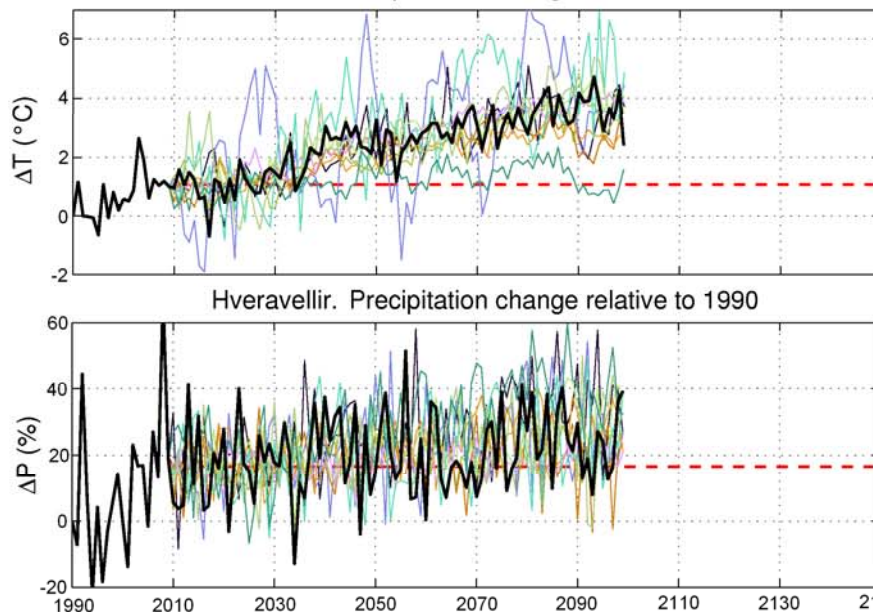


Samtengd ísflæði og afkomulíkön

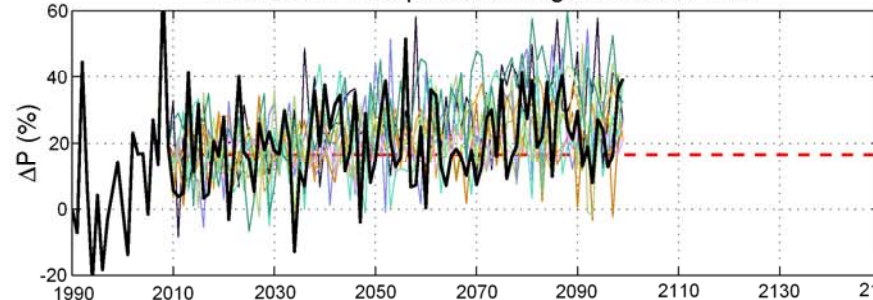
Lýsa svörun jökla við breytilegu loftslagi



Hveravellir. Temperature change relative to 1990

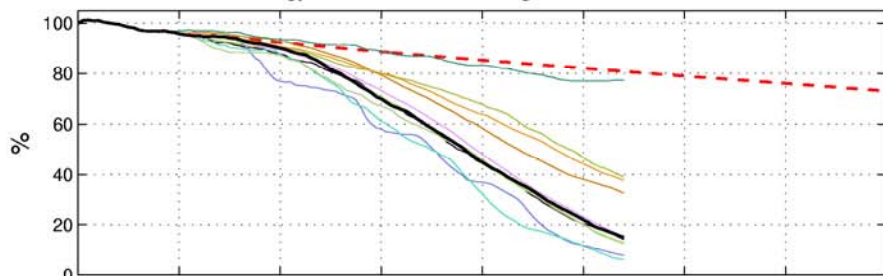


Hveravellir. Precipitation change relative to 1990

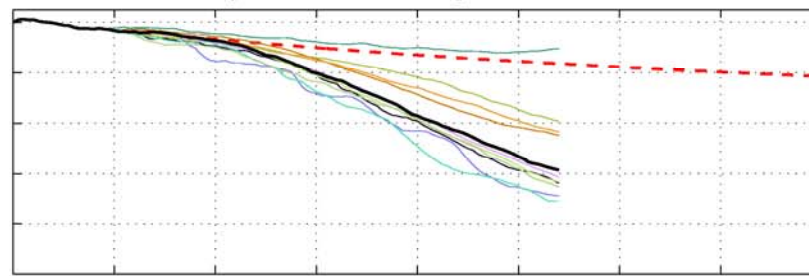


- Climate change scenario:
- Present day climate
 - DMI-HIRHAM5-ECHAM5
 - BCCR-BCM2
 - CCCMA-CGCM31
 - CSIRO-MK35
 - MIROC32-Medres
 - MPI-ECHAM5
 - MRI-CGCM232a
 - NCAR-CCSM3
 - UKMO-HasCM3
 - UKMO-HadGEM1
 - MIUB-Echo-G

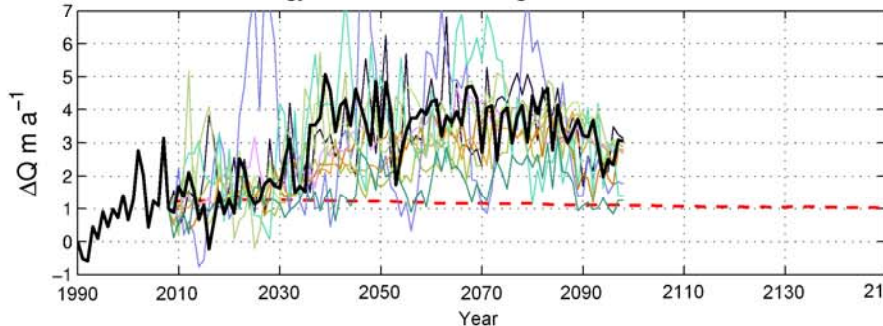
Langjökull. Volume change relative to 1990



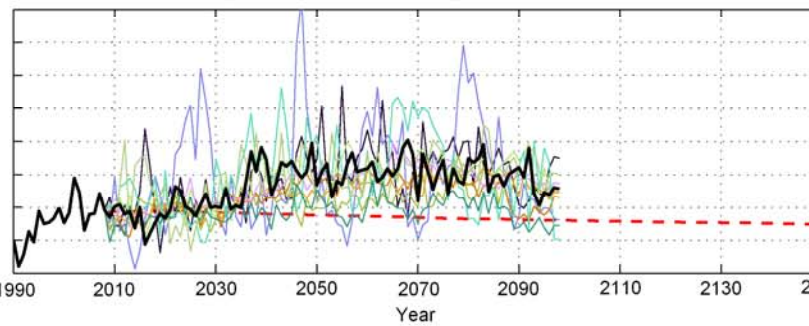
Hofsjökull. Volume change relative to 1990



Langjökull. Run off change relative to 1990

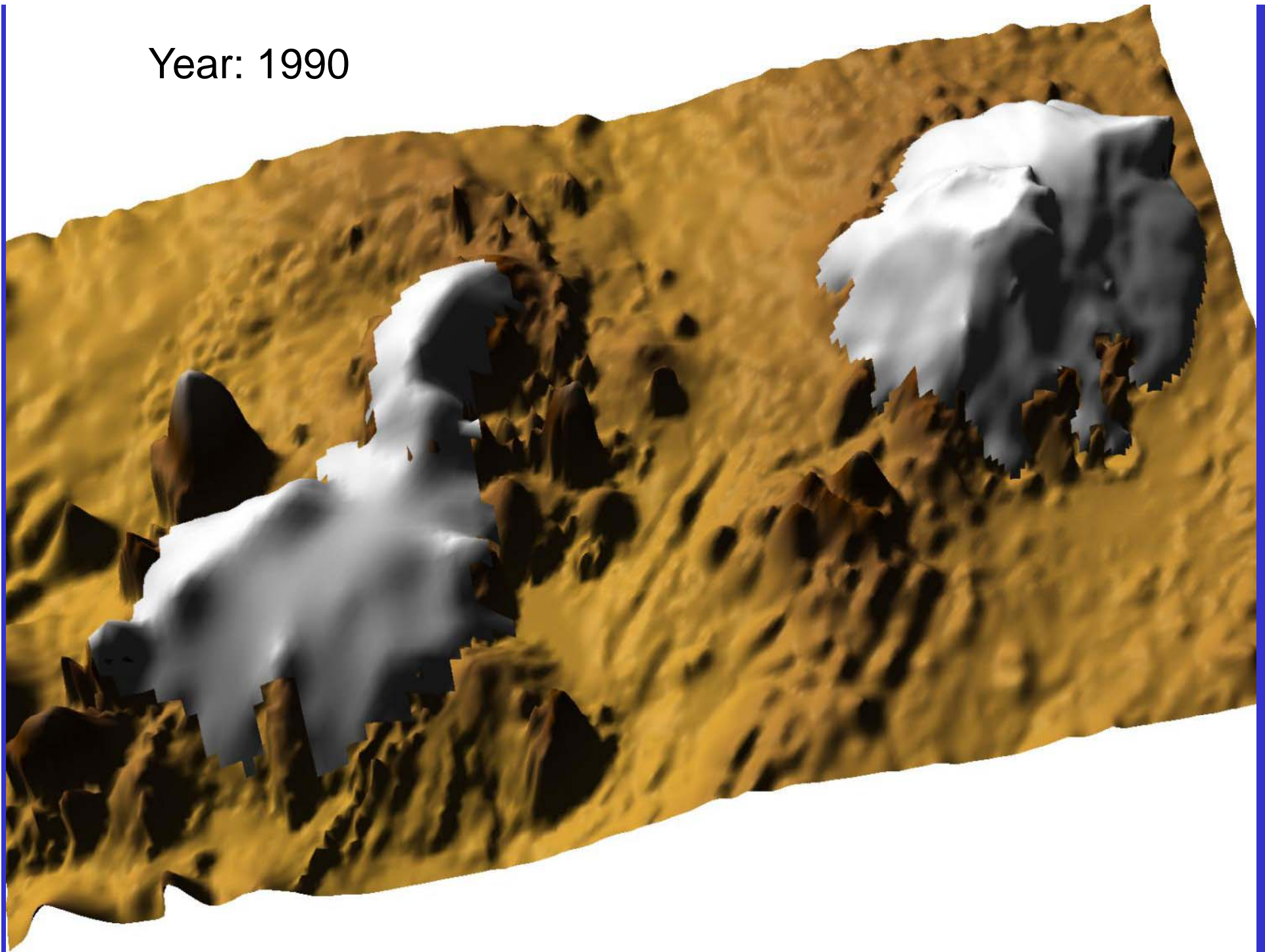


Hofsjökull. Run off change relative to 1990

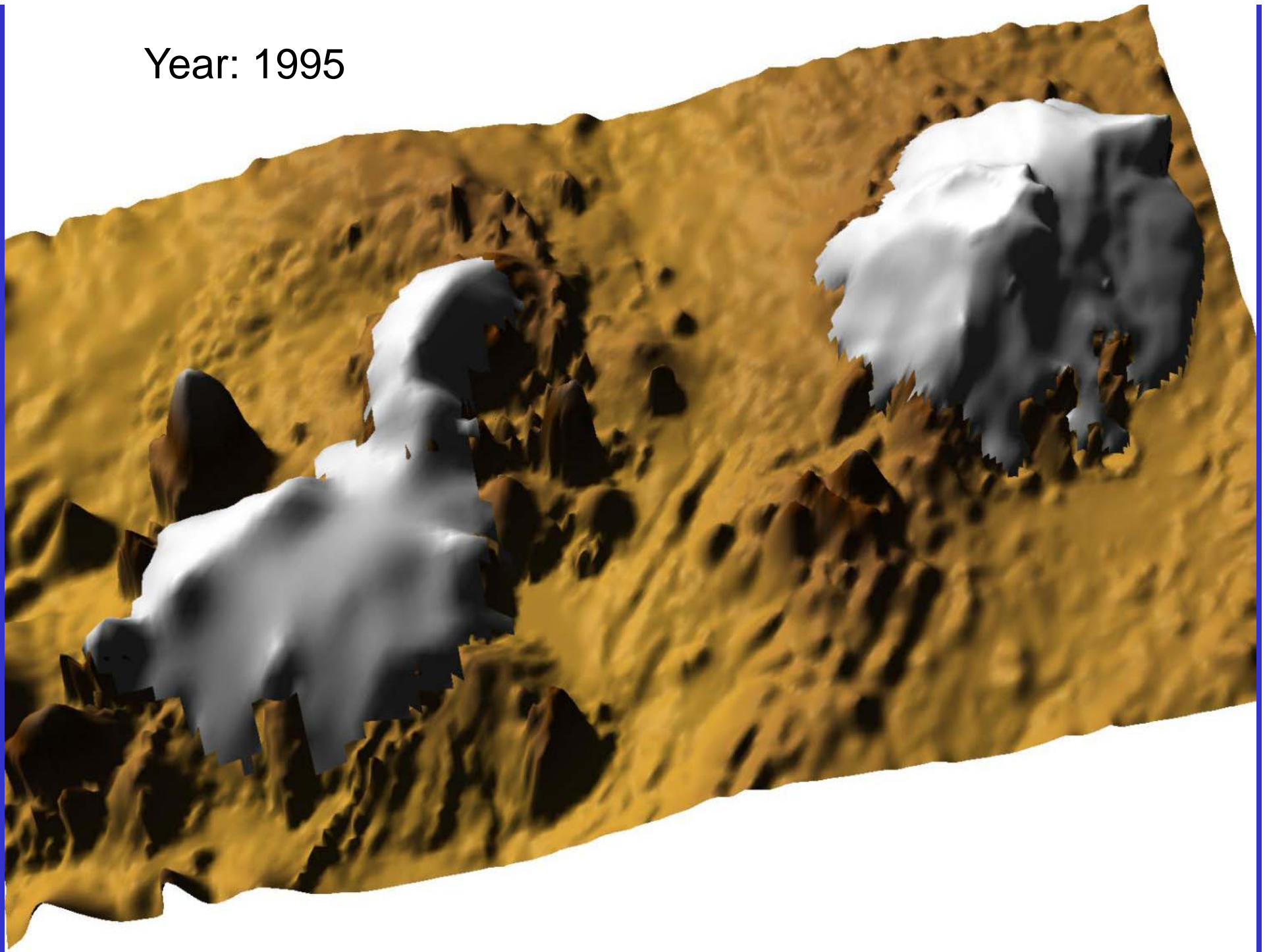




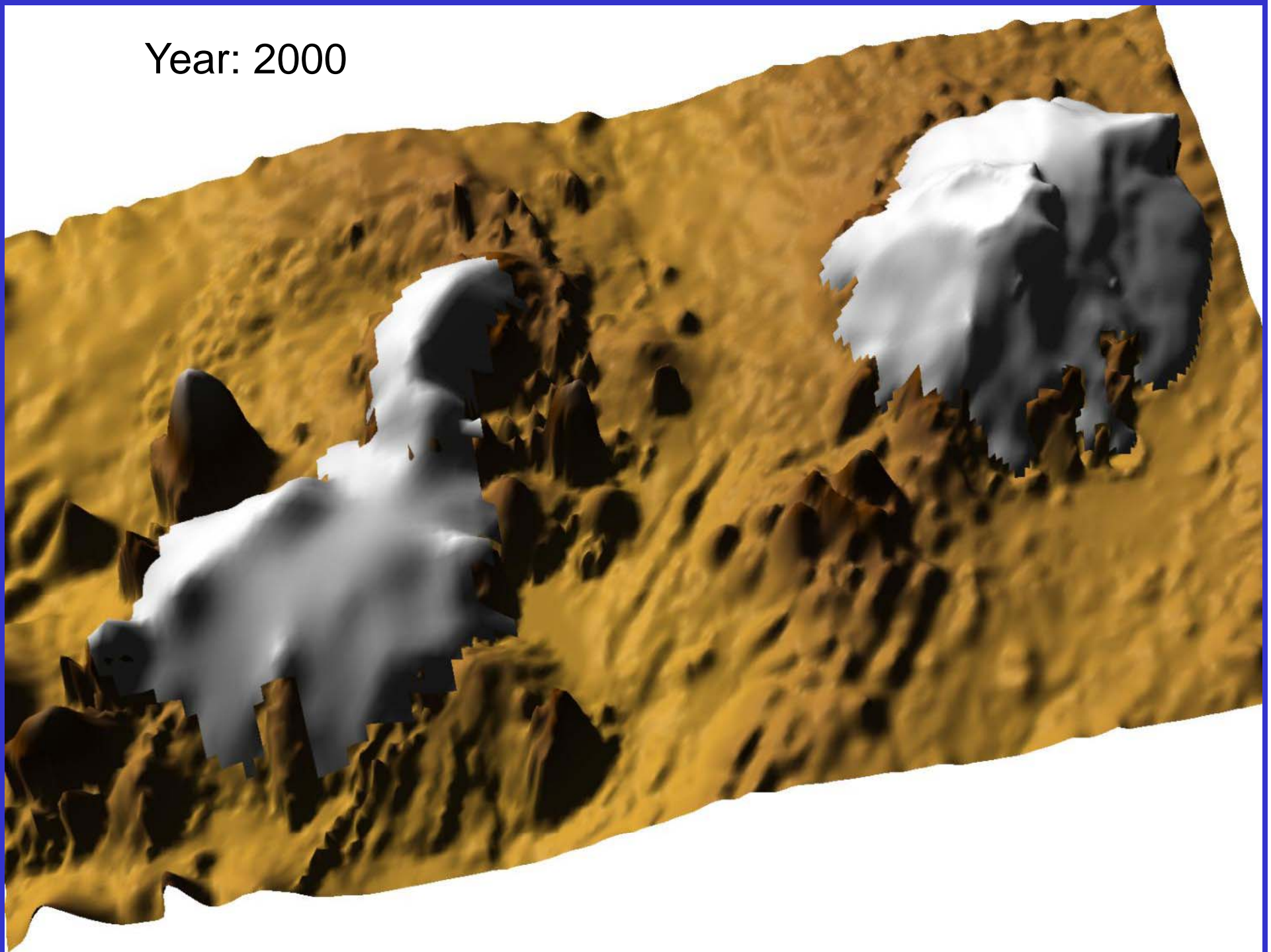
Year: 1990



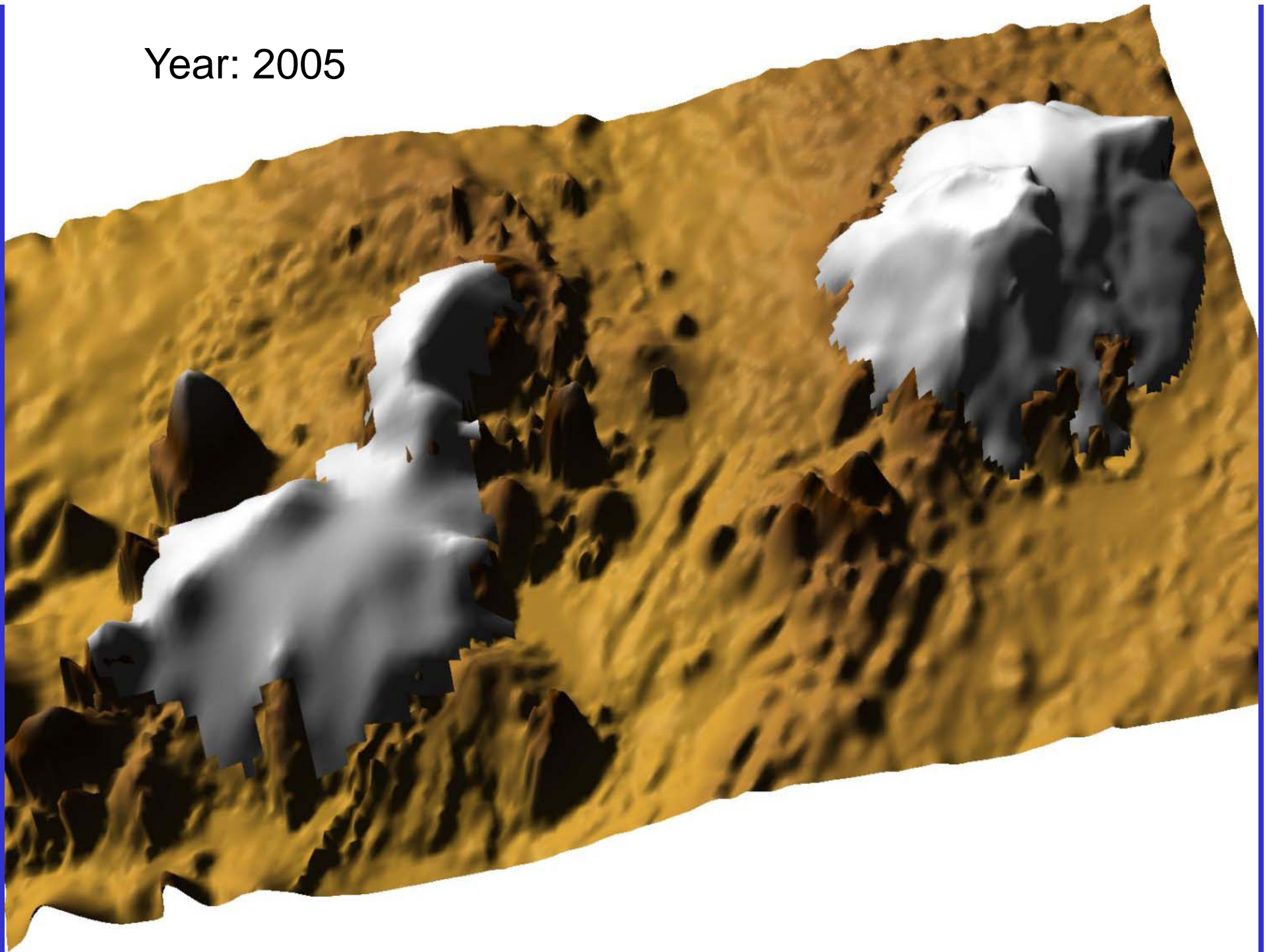
Year: 1995



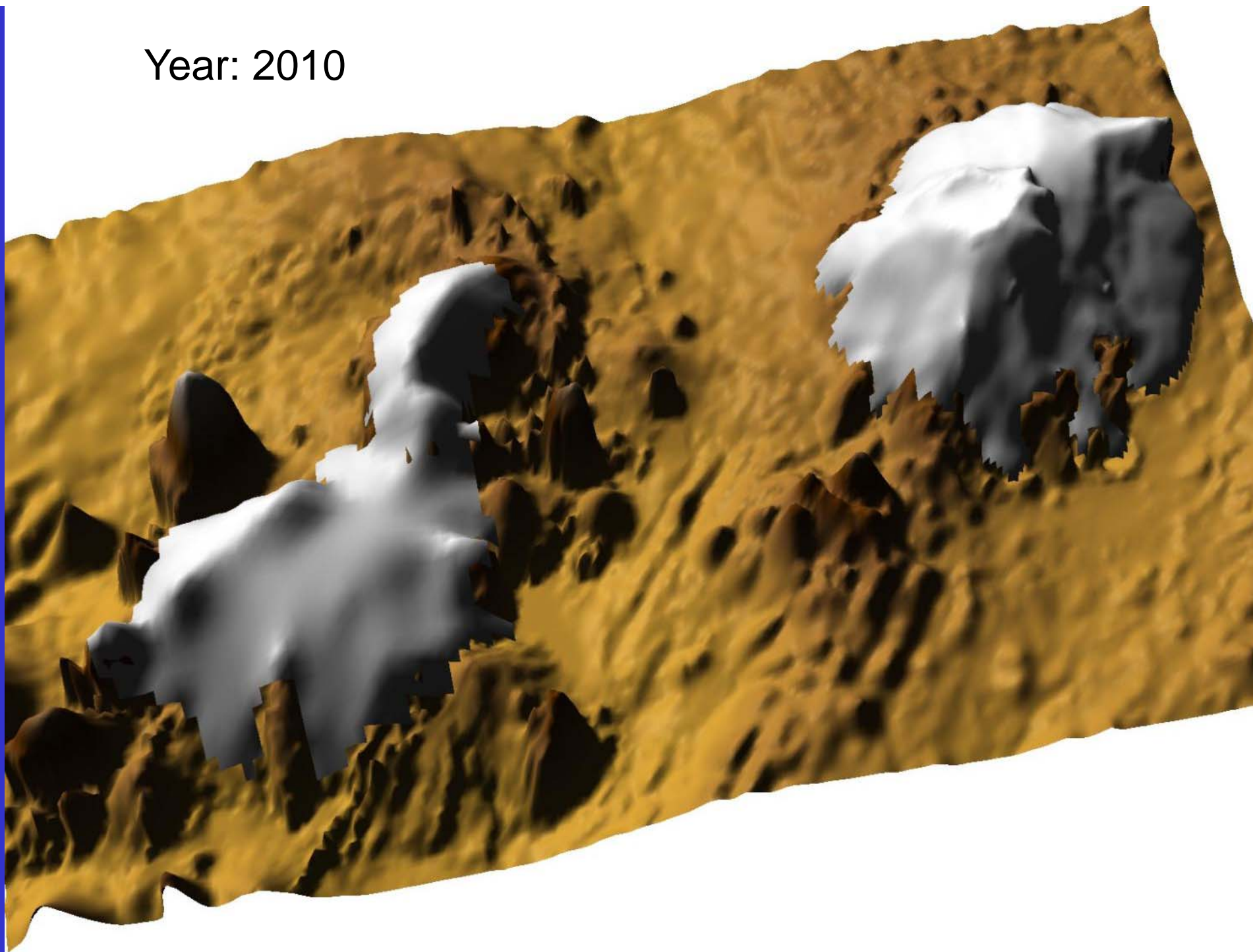
Year: 2000



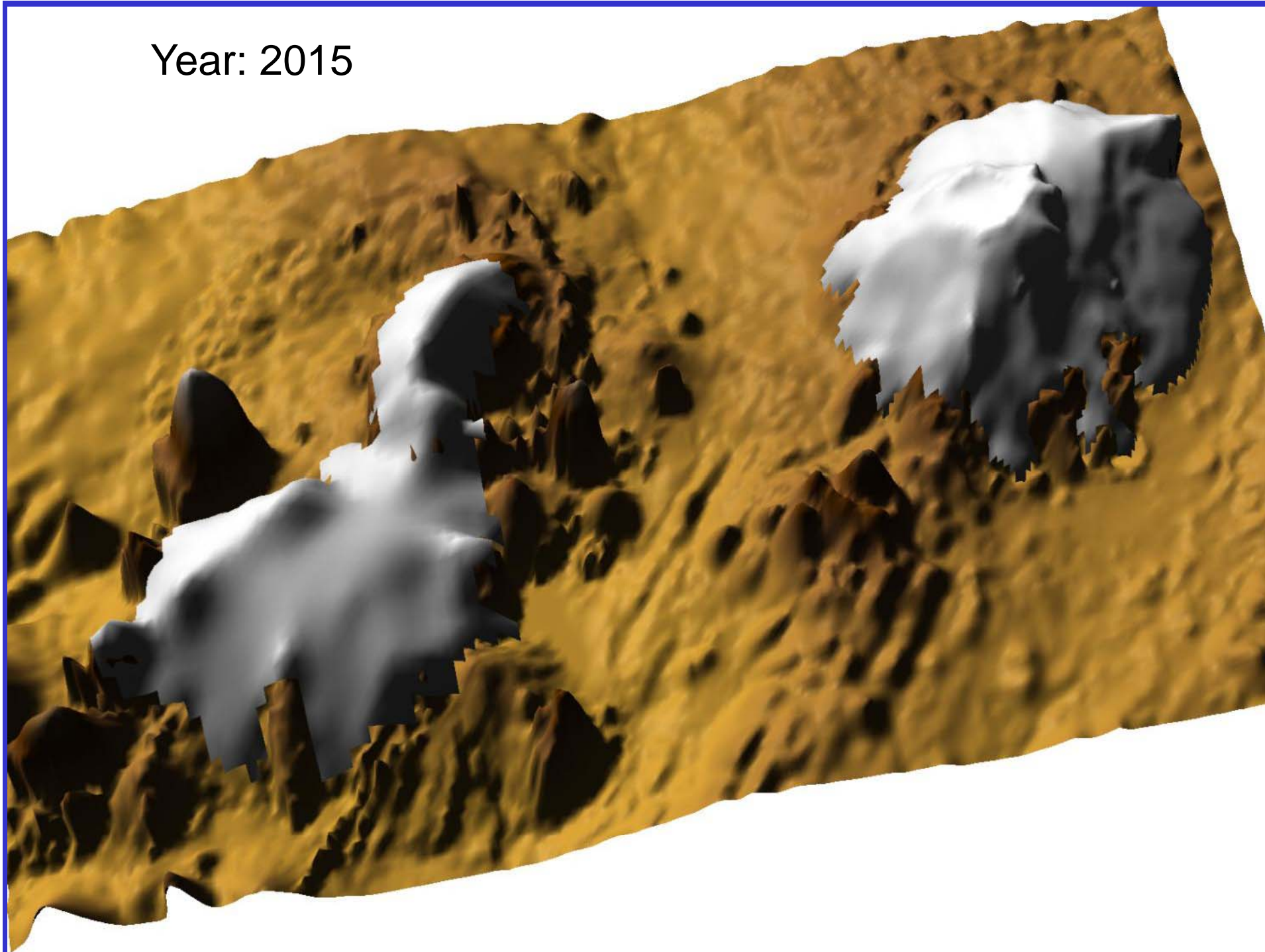
Year: 2005



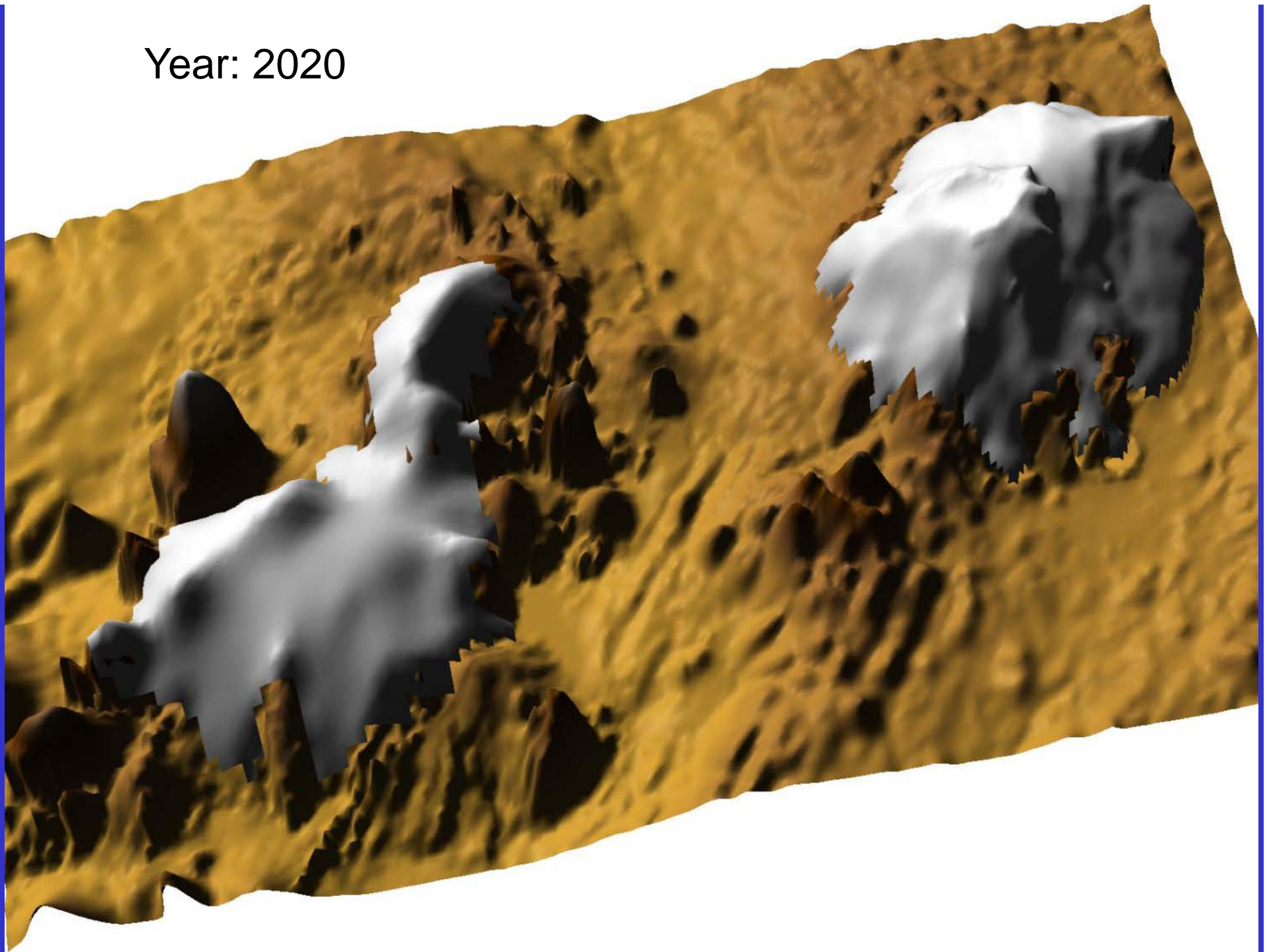
Year: 2010



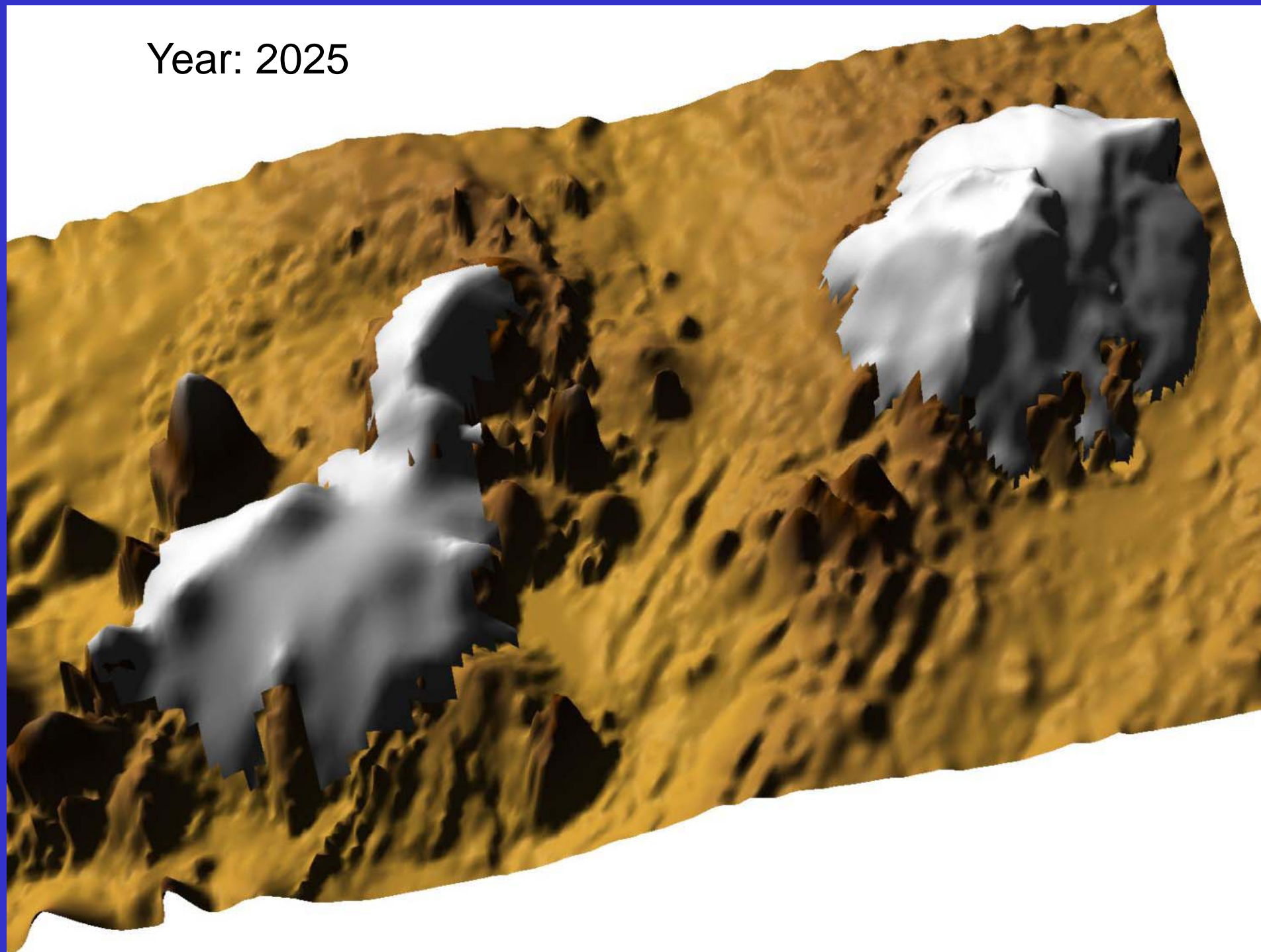
Year: 2015



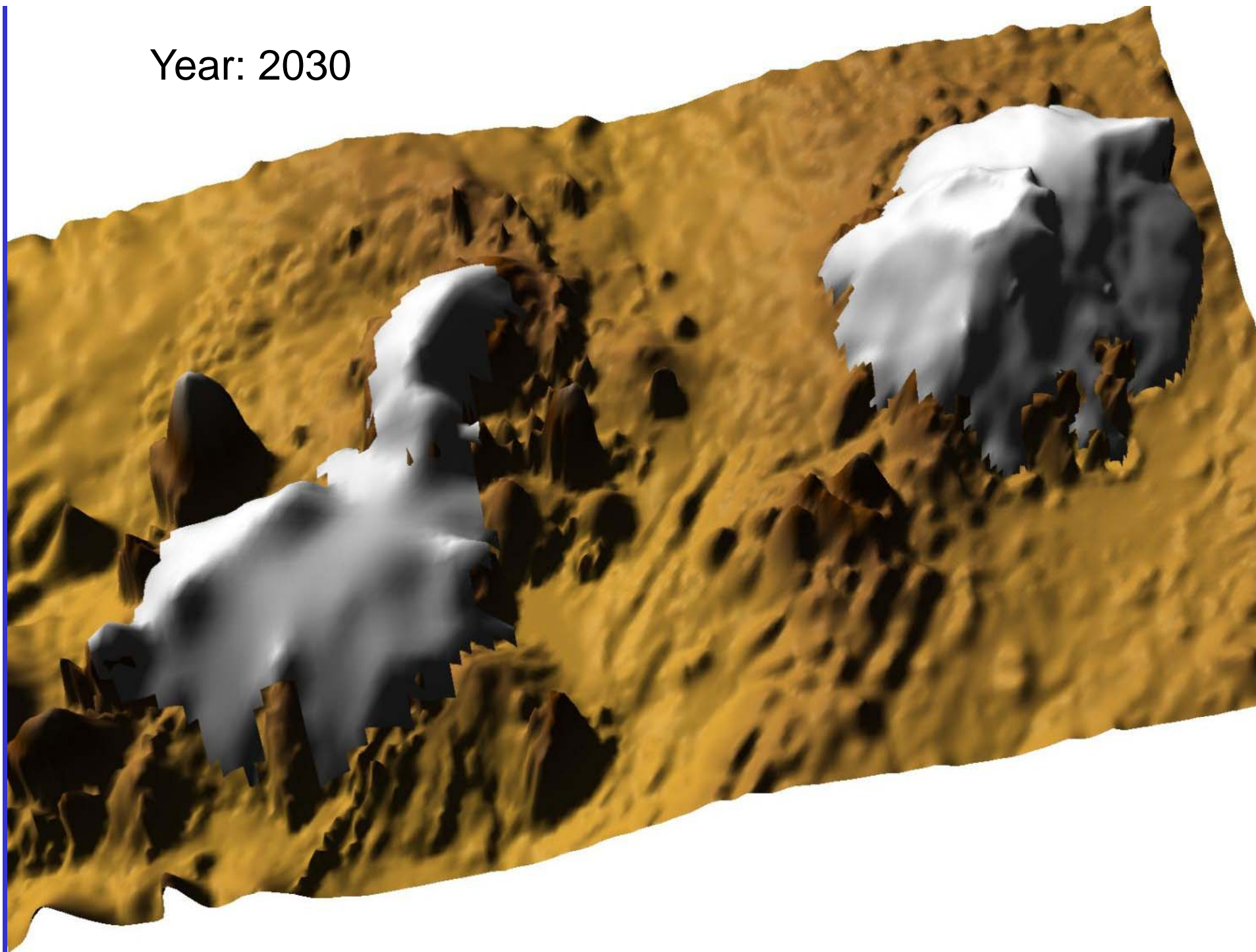
Year: 2020



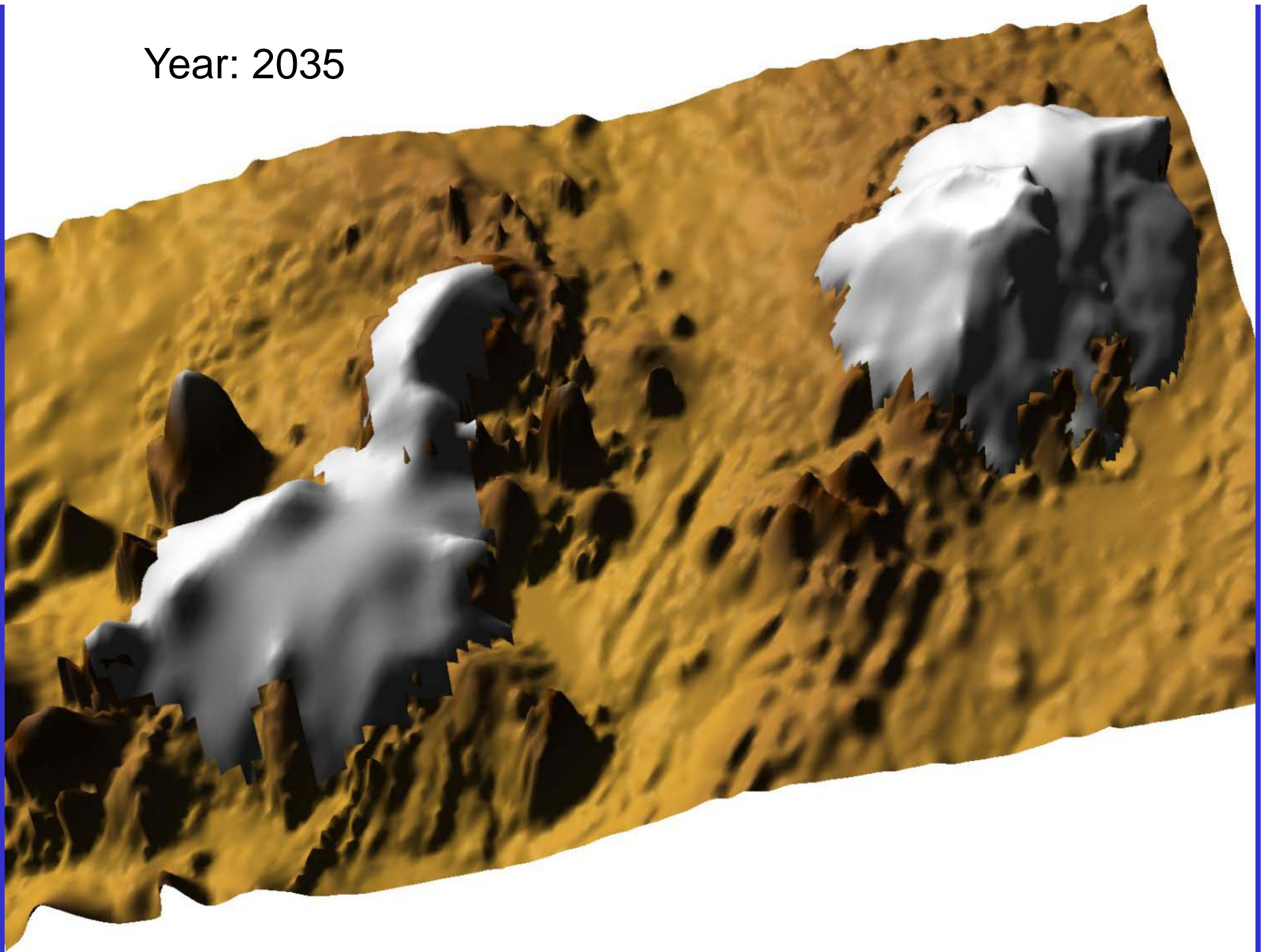
Year: 2025



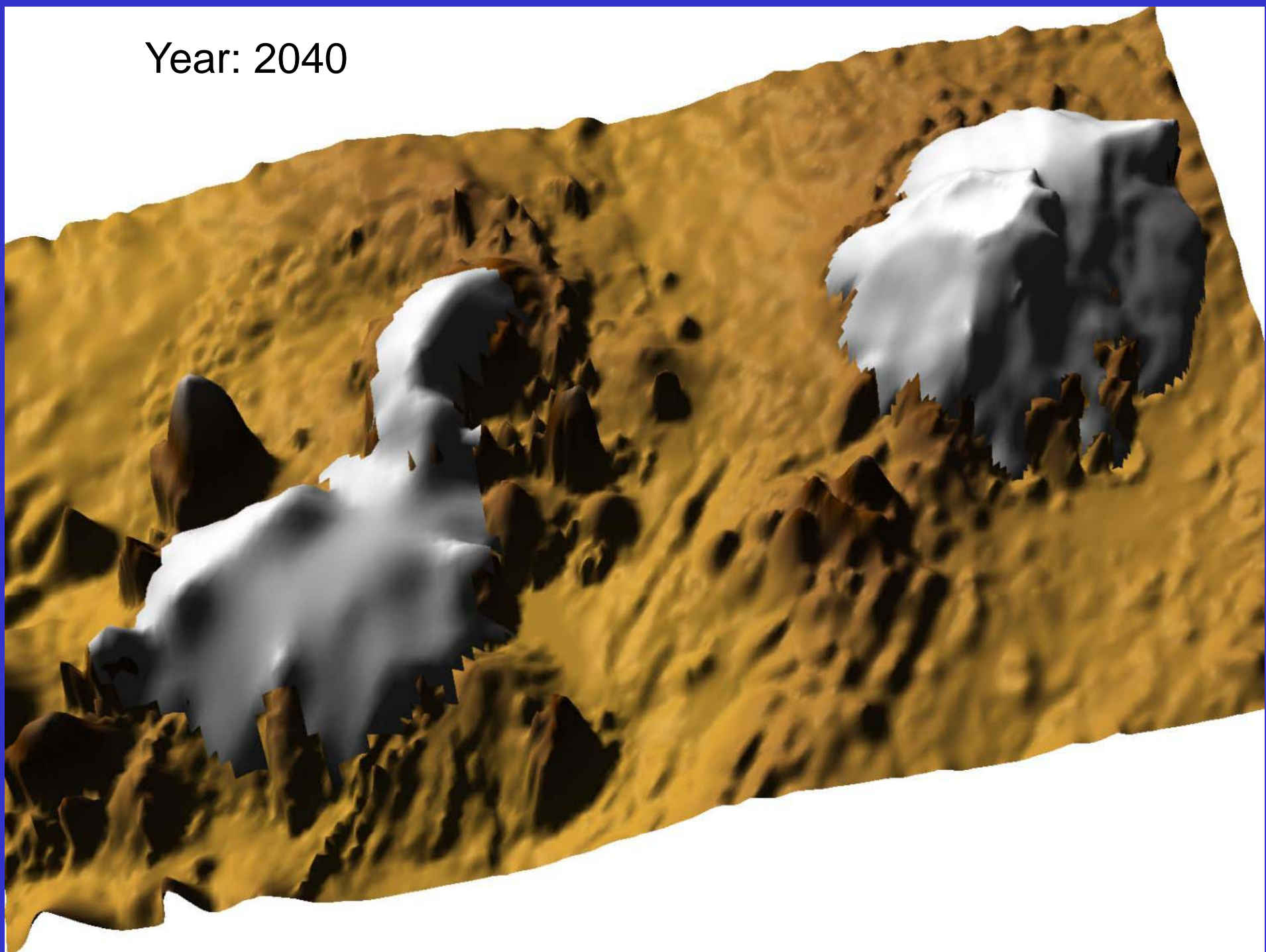
Year: 2030



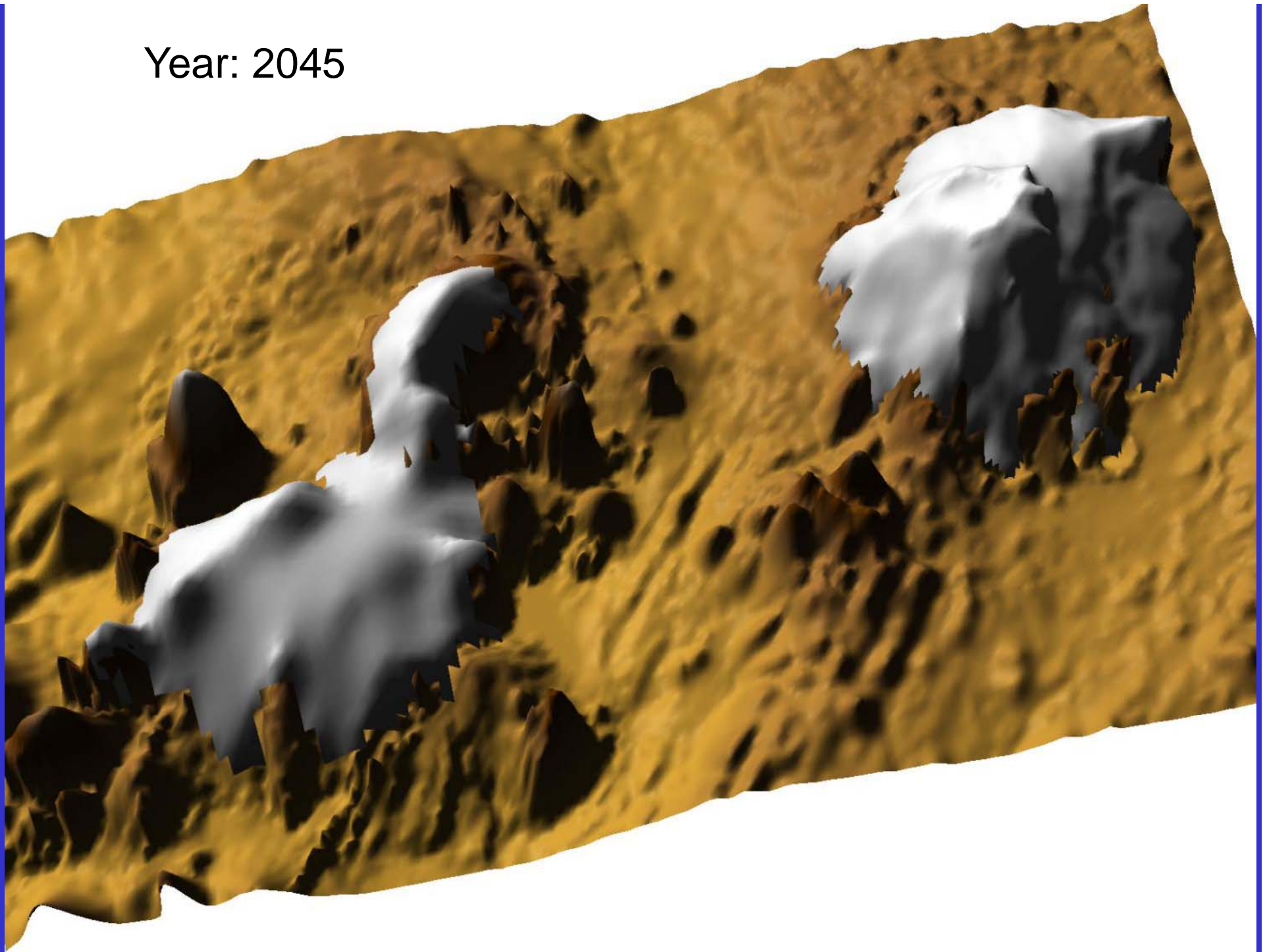
Year: 2035



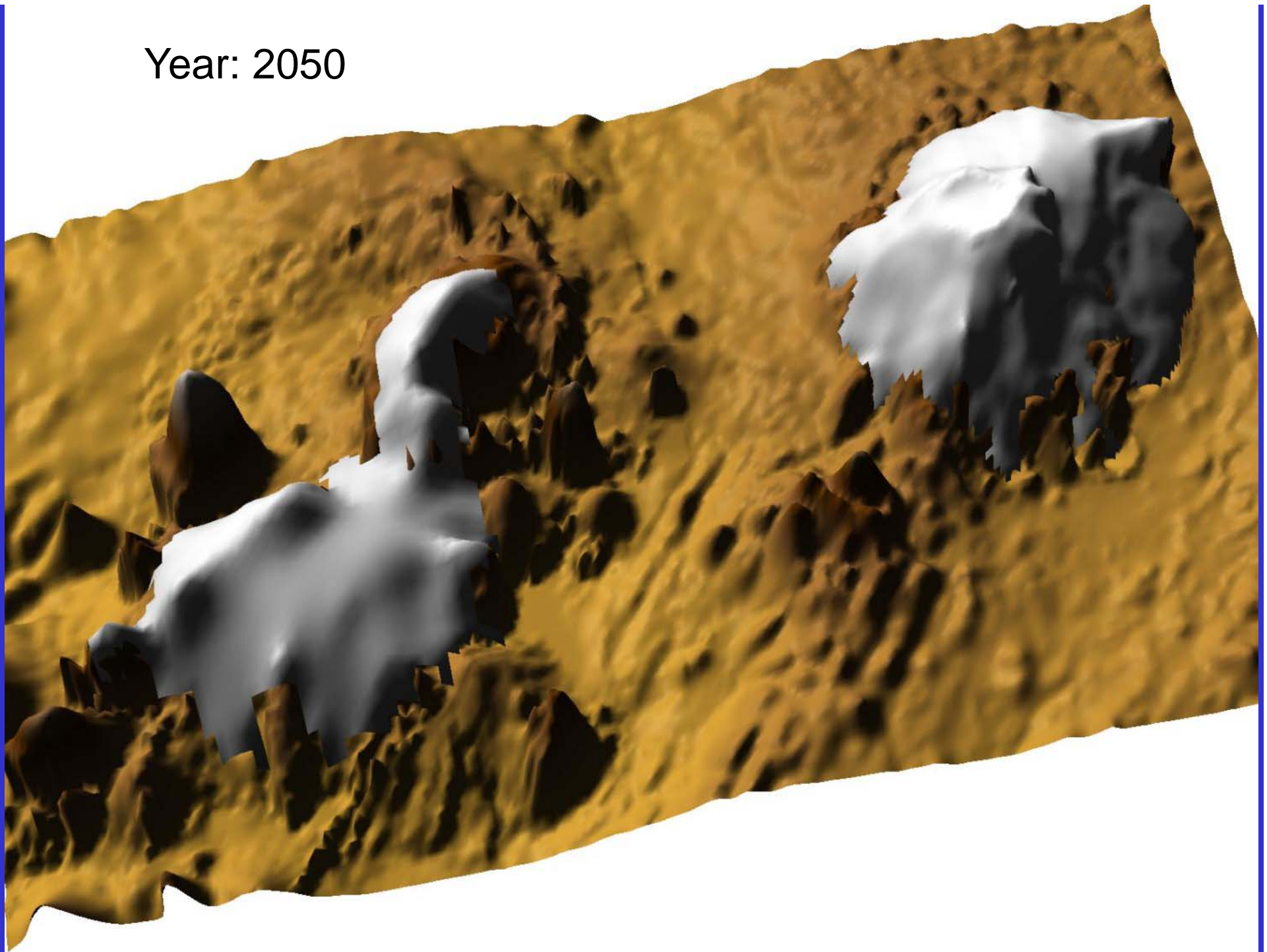
Year: 2040



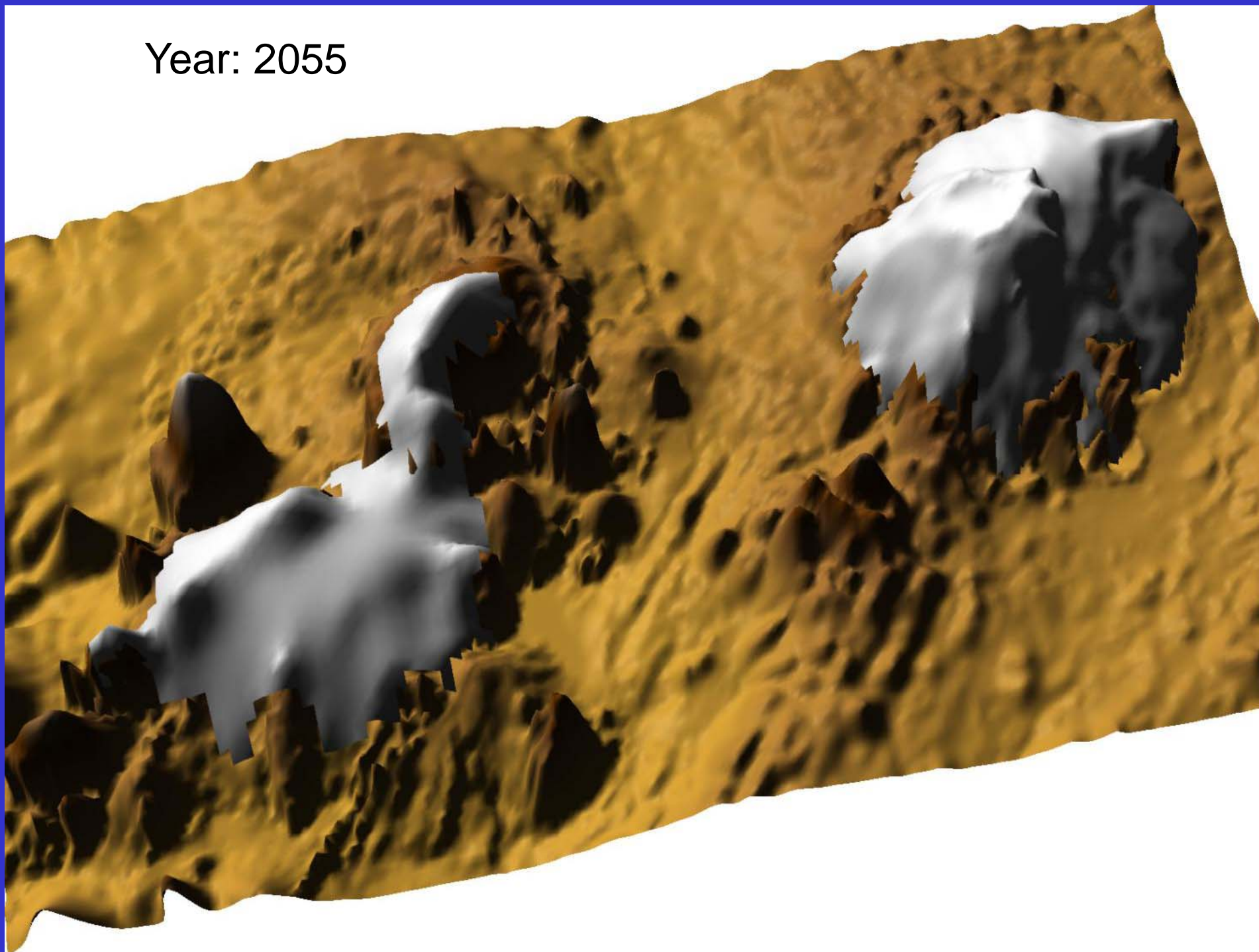
Year: 2045



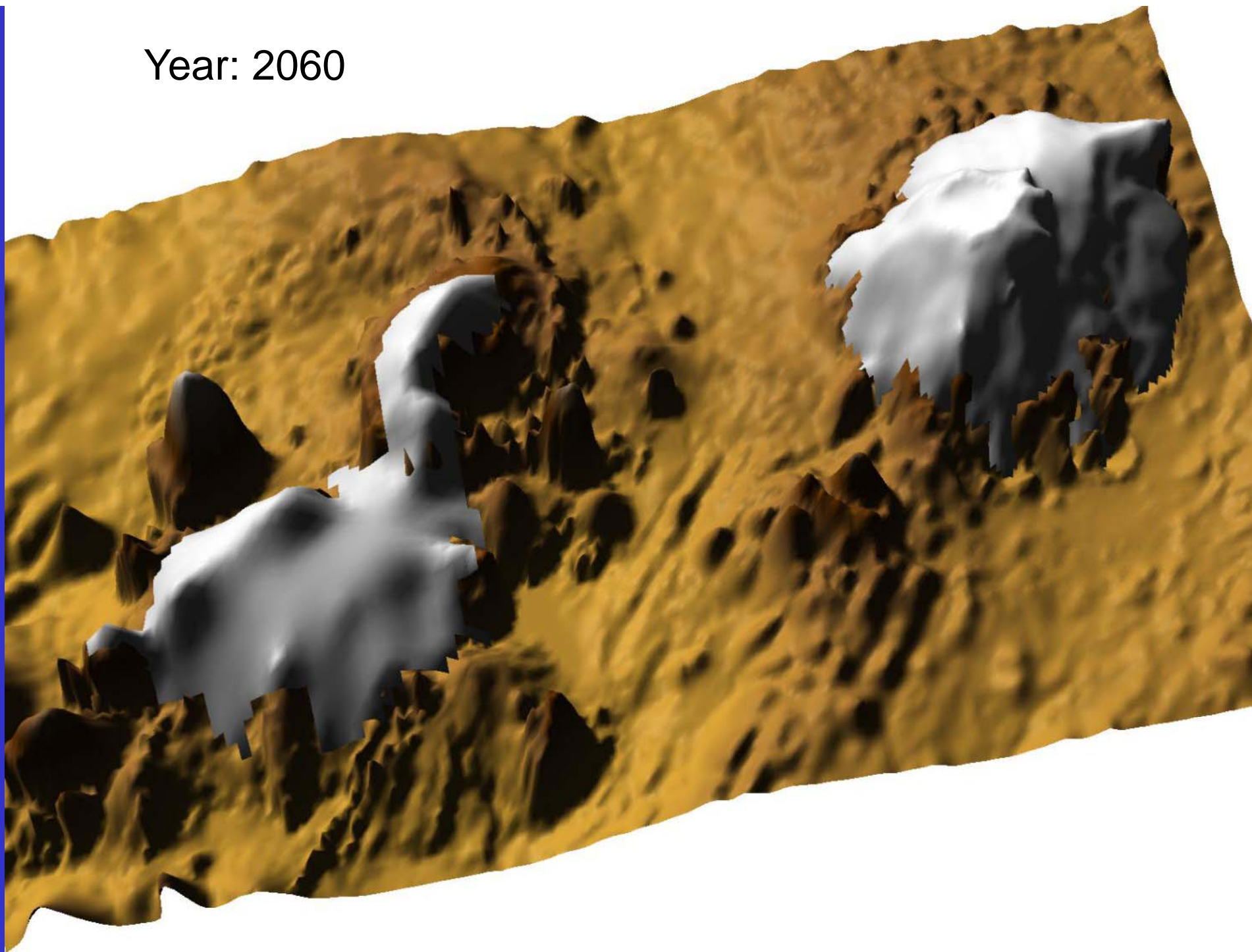
Year: 2050



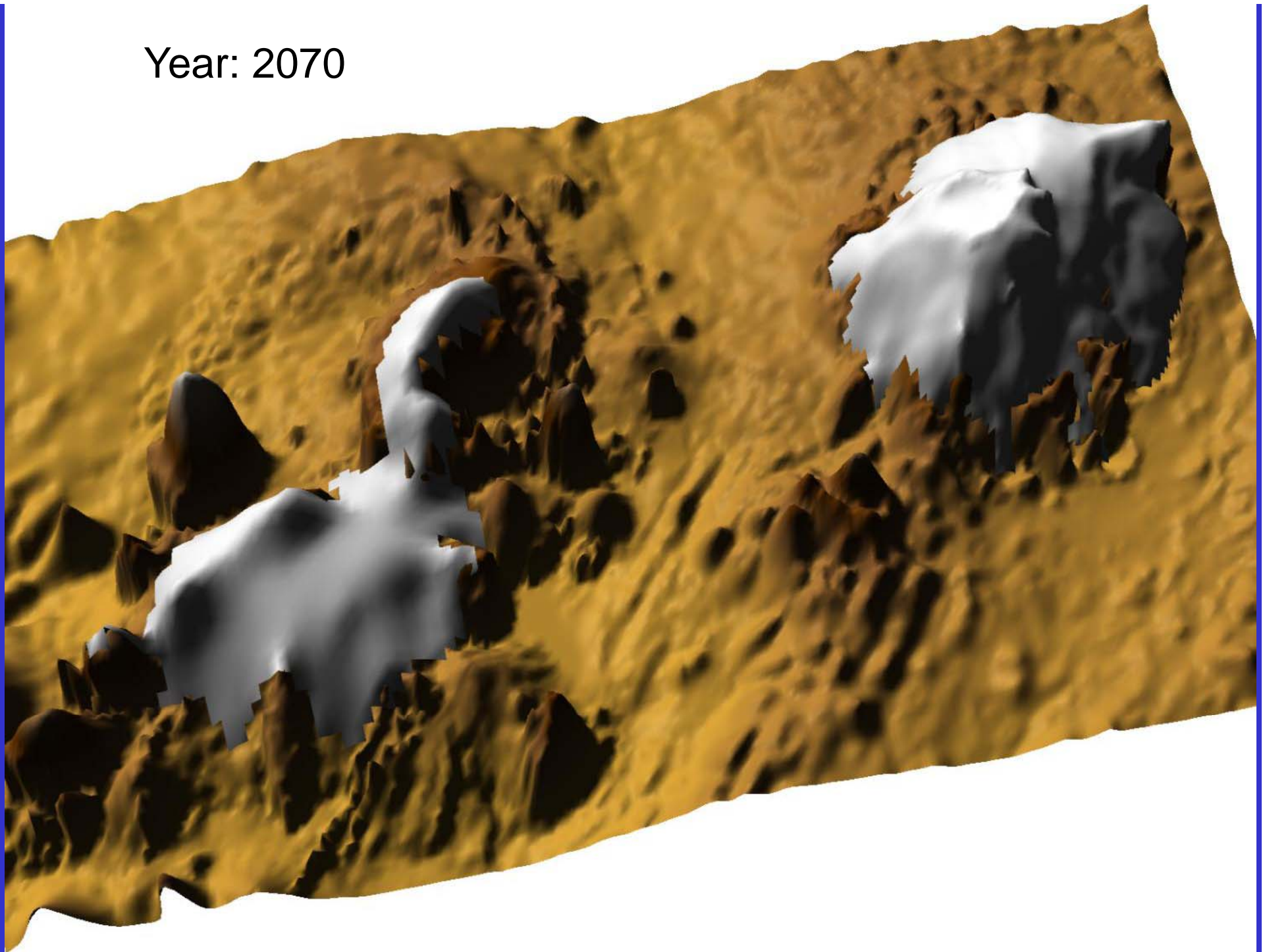
Year: 2055



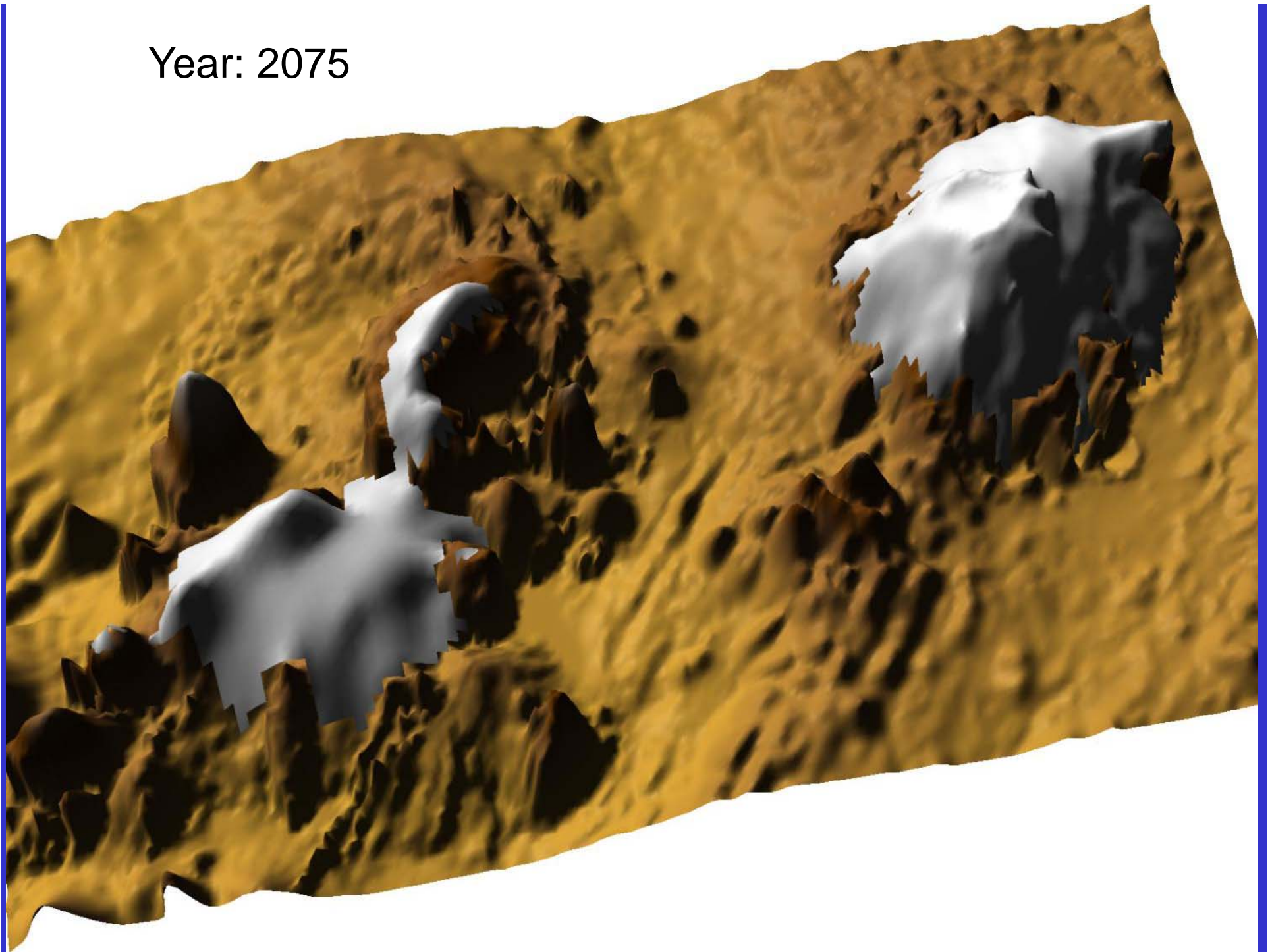
Year: 2060



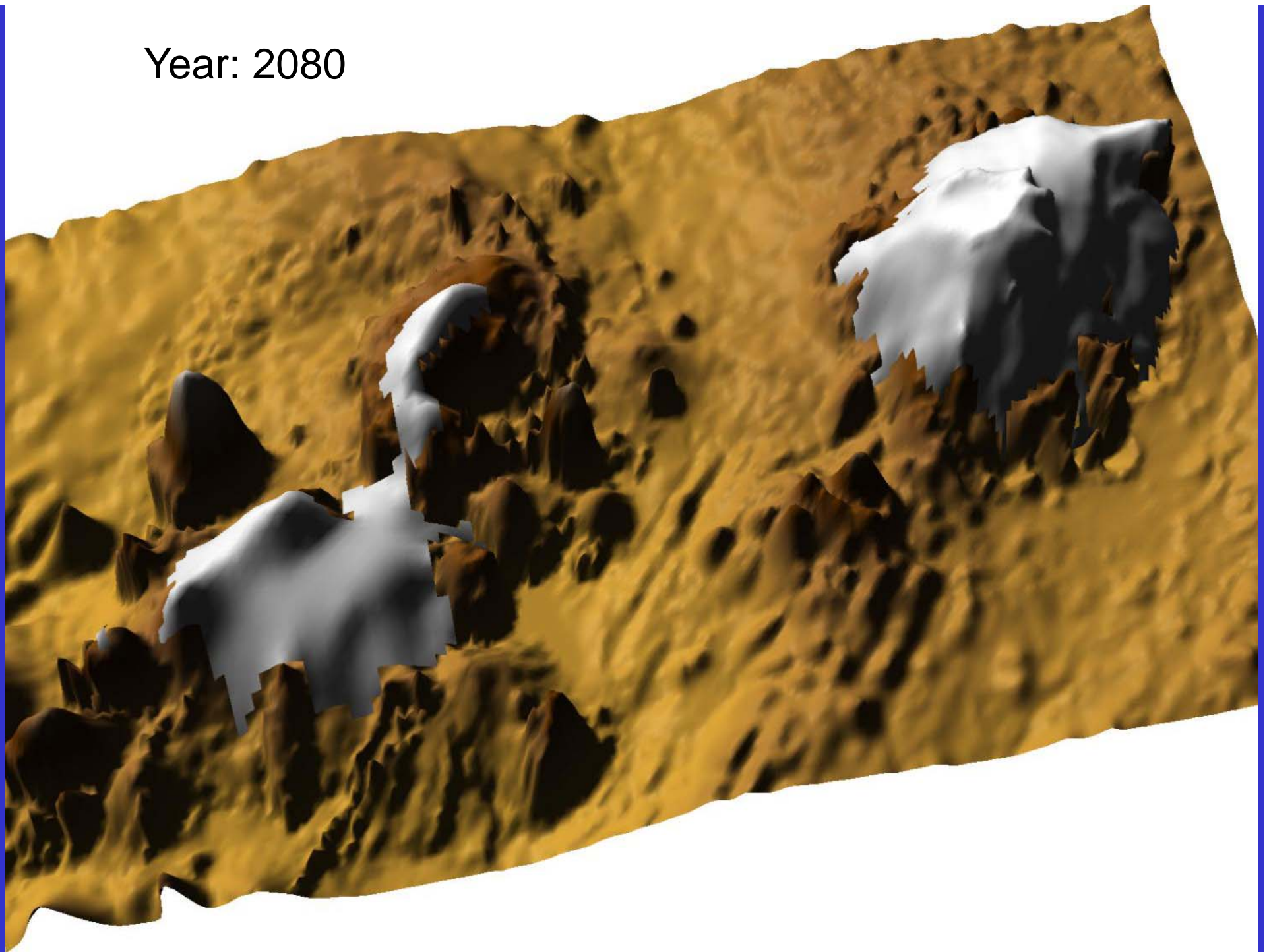
Year: 2070



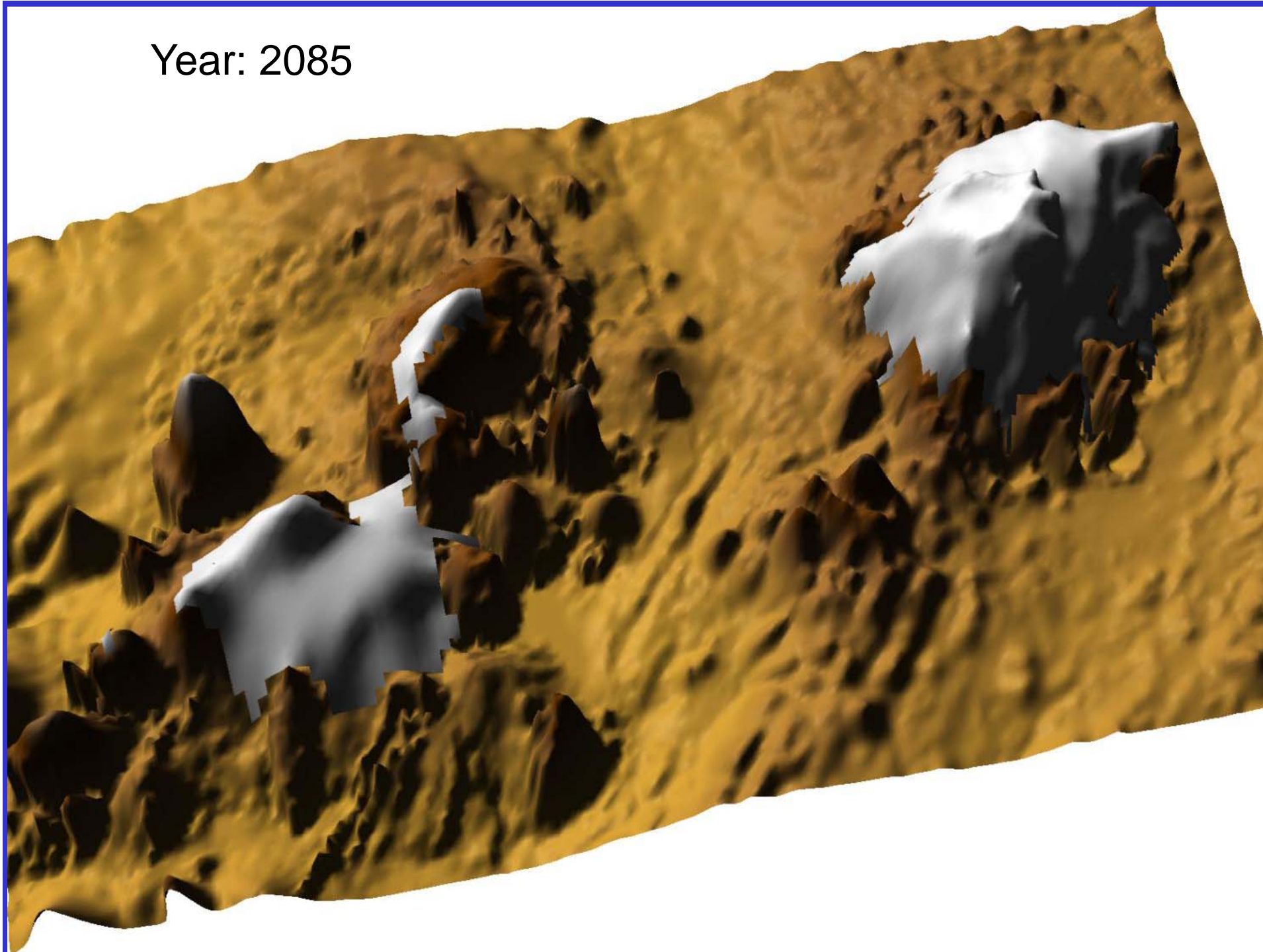
Year: 2075



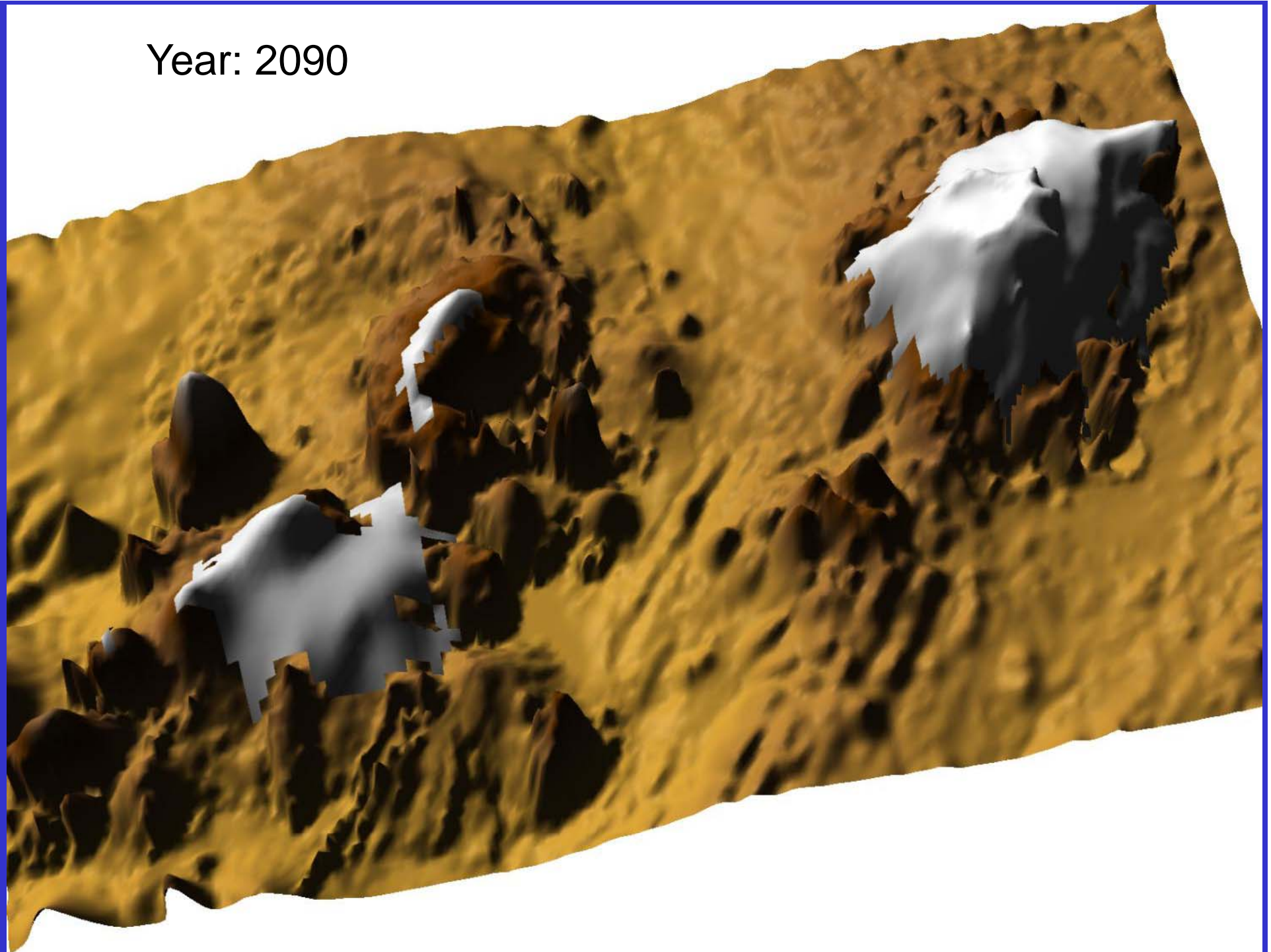
Year: 2080



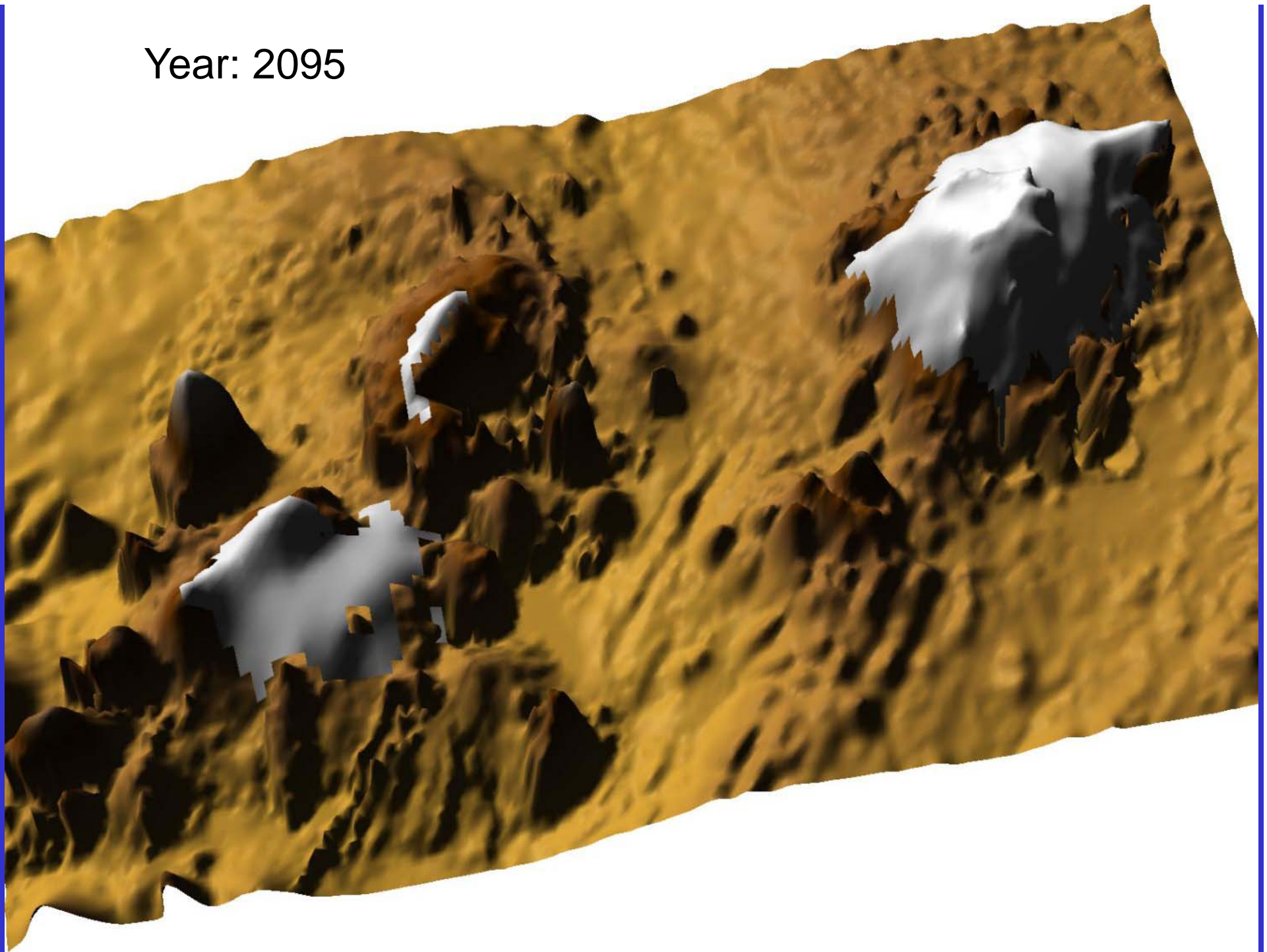
Year: 2085



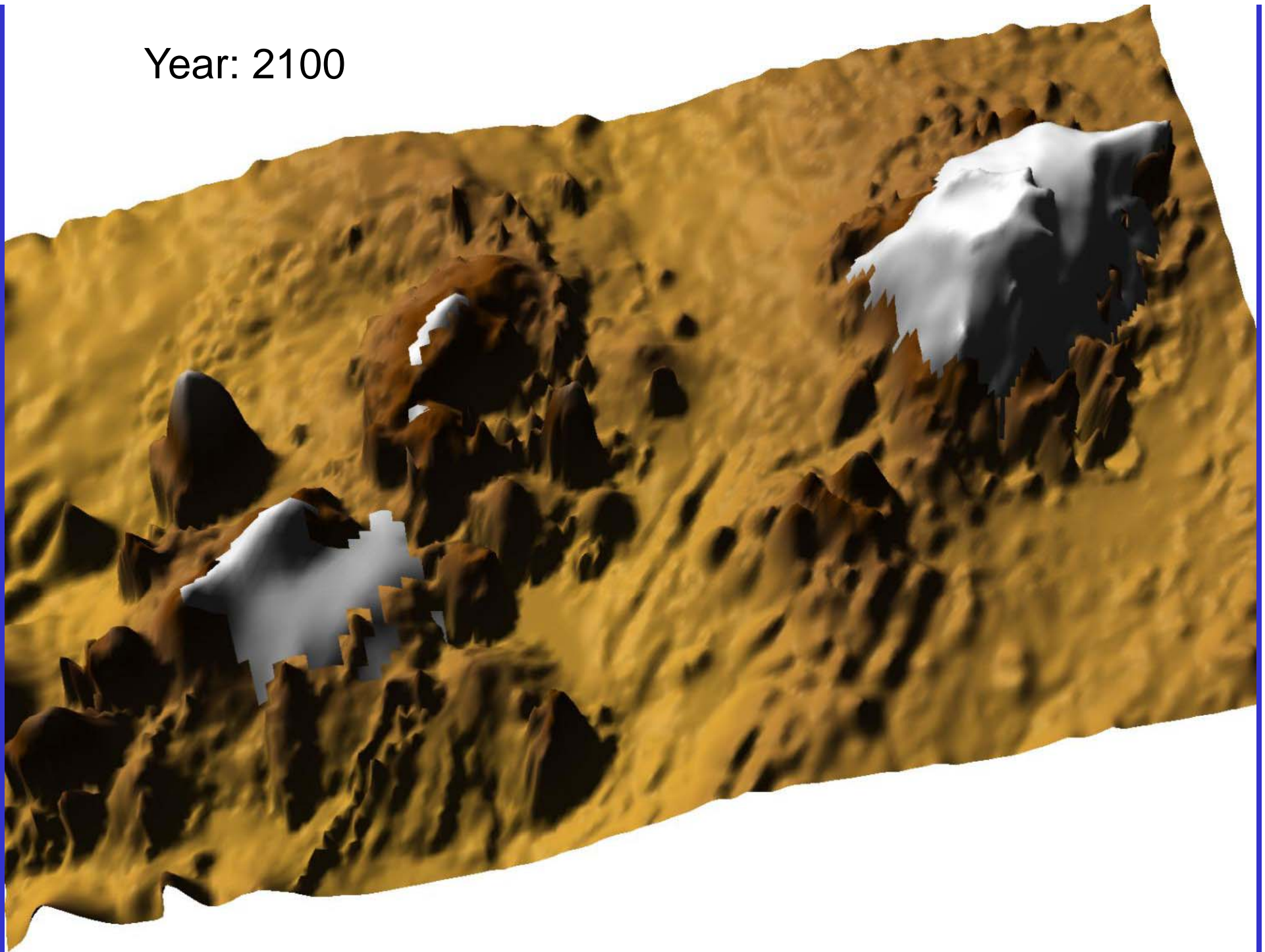
Year: 2090



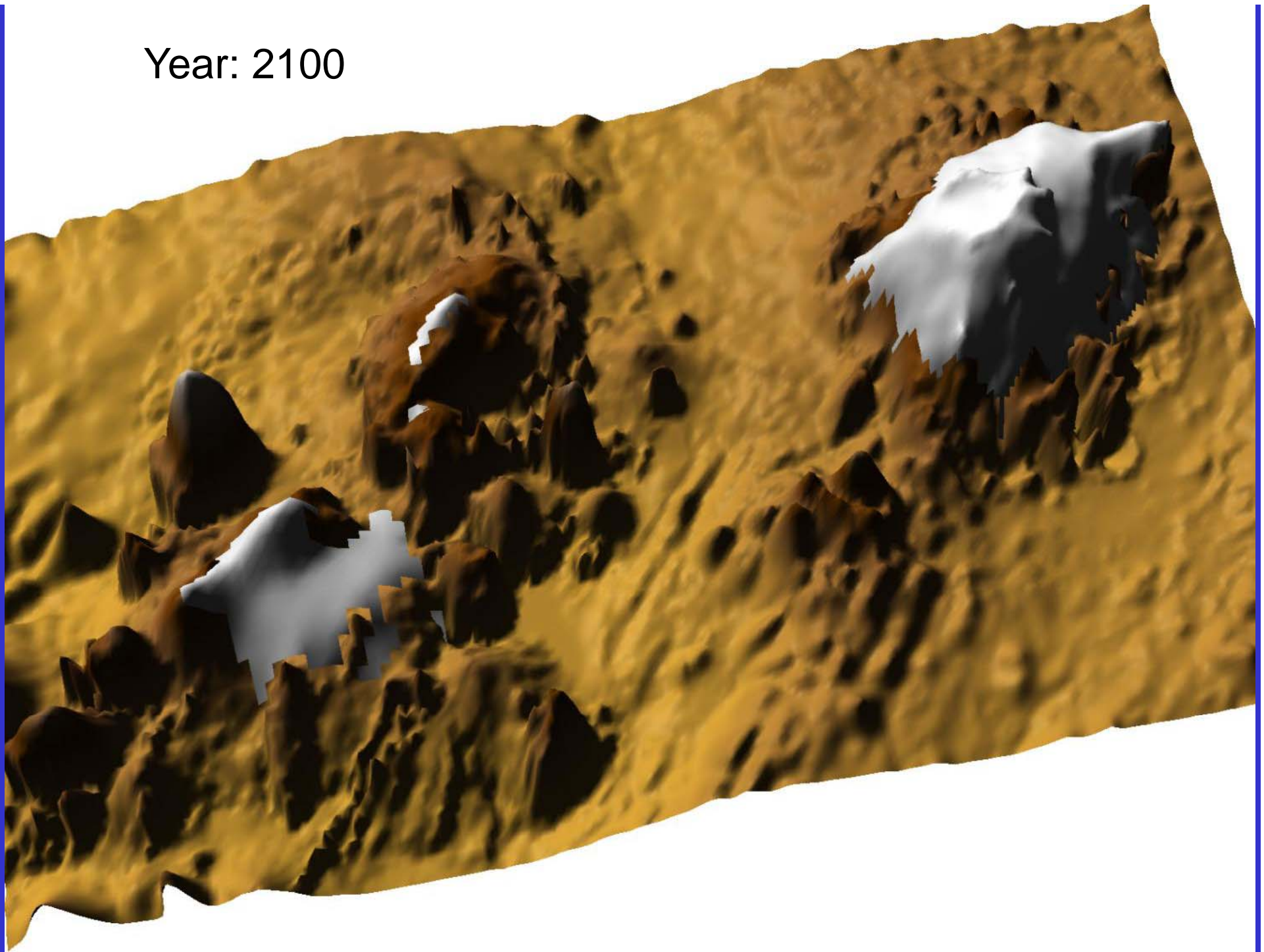
Year: 2095



Year: 2100

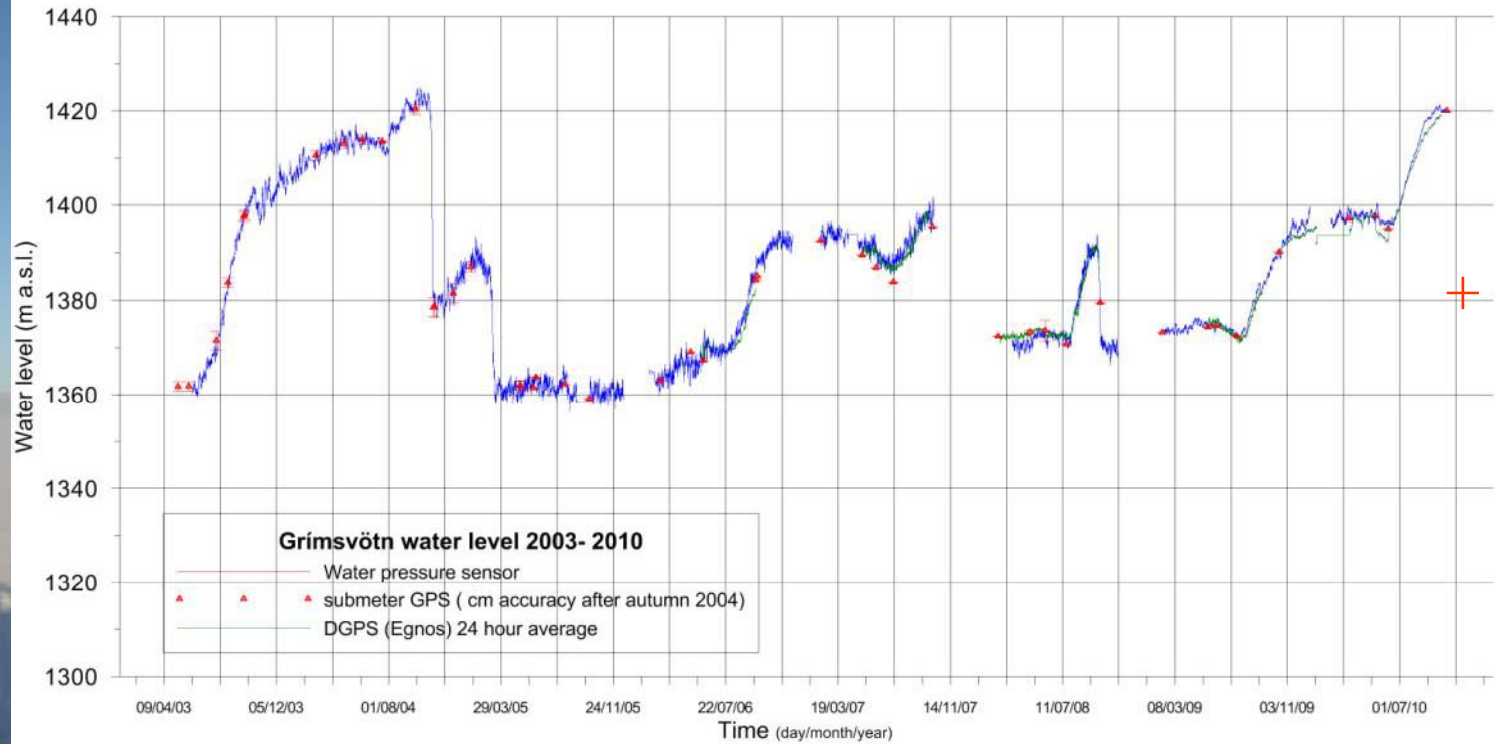


Year: 2100





ár	mánuður	flatarmál	Ísþykkt	Vatnsborð fyrir hlaup	Vatnsborð eftir hlaup	dZ	Rúmmál fyrir hlaup	Rúmmál eftir hlaup	Rúmmál frá Gv	Rúmmál hlaups	Hámarksrennsli	
		km ²	m	m y.s.	m y.s.	m	km ³	km ³	km ³	km ³	10 ³ m ³ s ⁻¹	
2004	okt-nóv	16,49		1422	1378	44	0,73	0,19	0,65		~4	0,1 v. bræðslu í gosi
2005	mars	9,57		1385	1361	24	0,56	0,09	0,47			
2007	október	12,13		1400	1372	28	0,42	0,15	0,27			
2008	sept-okt	10,72		1391	1369	22	0,32	0,13	0,19			



Takk !

