New DEMs for Pine Island Glacier from GLAS — Data Analysis and Glaciologic Change Detection

Ute C. Herzfeld[1]

with contributions from

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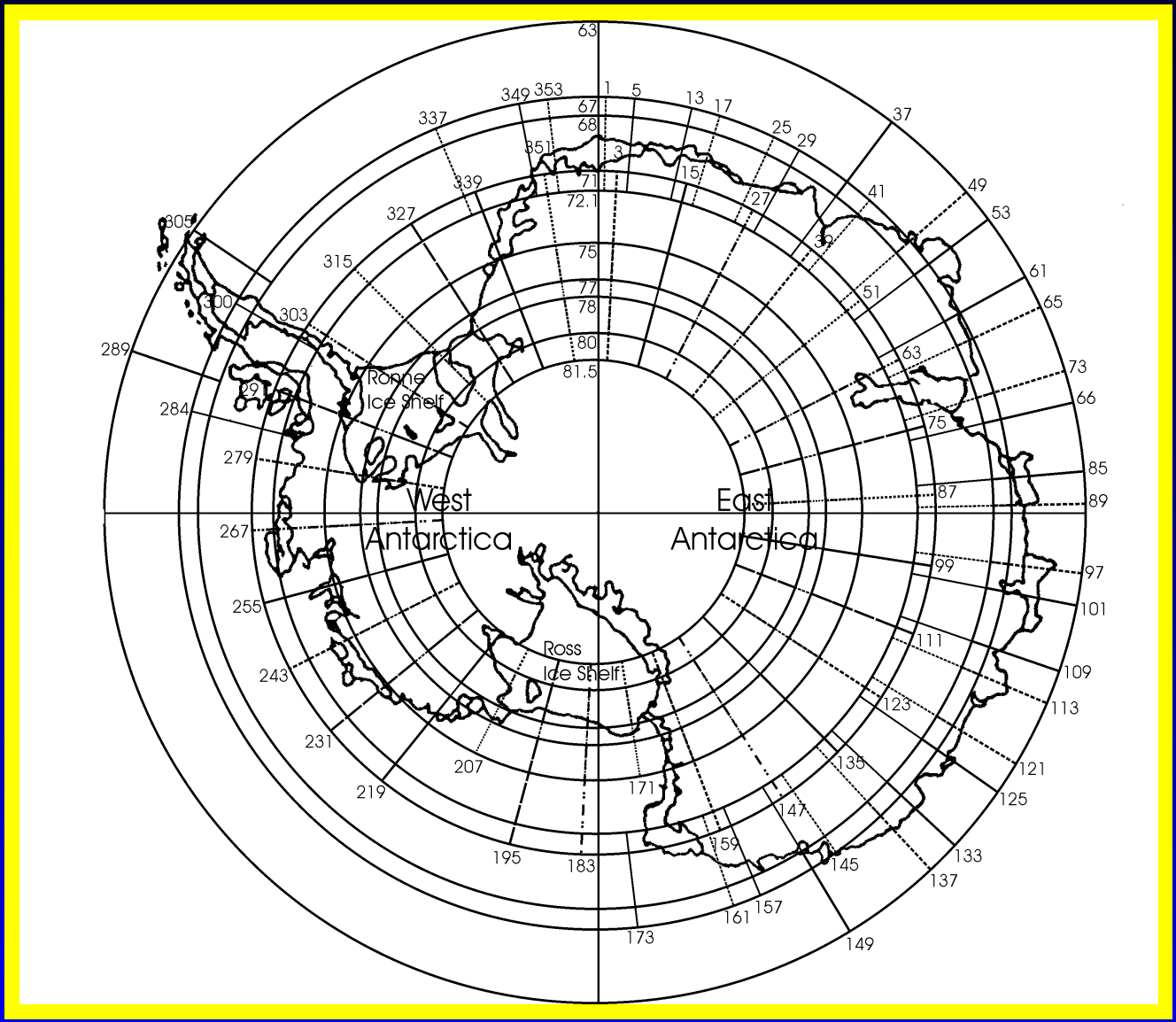
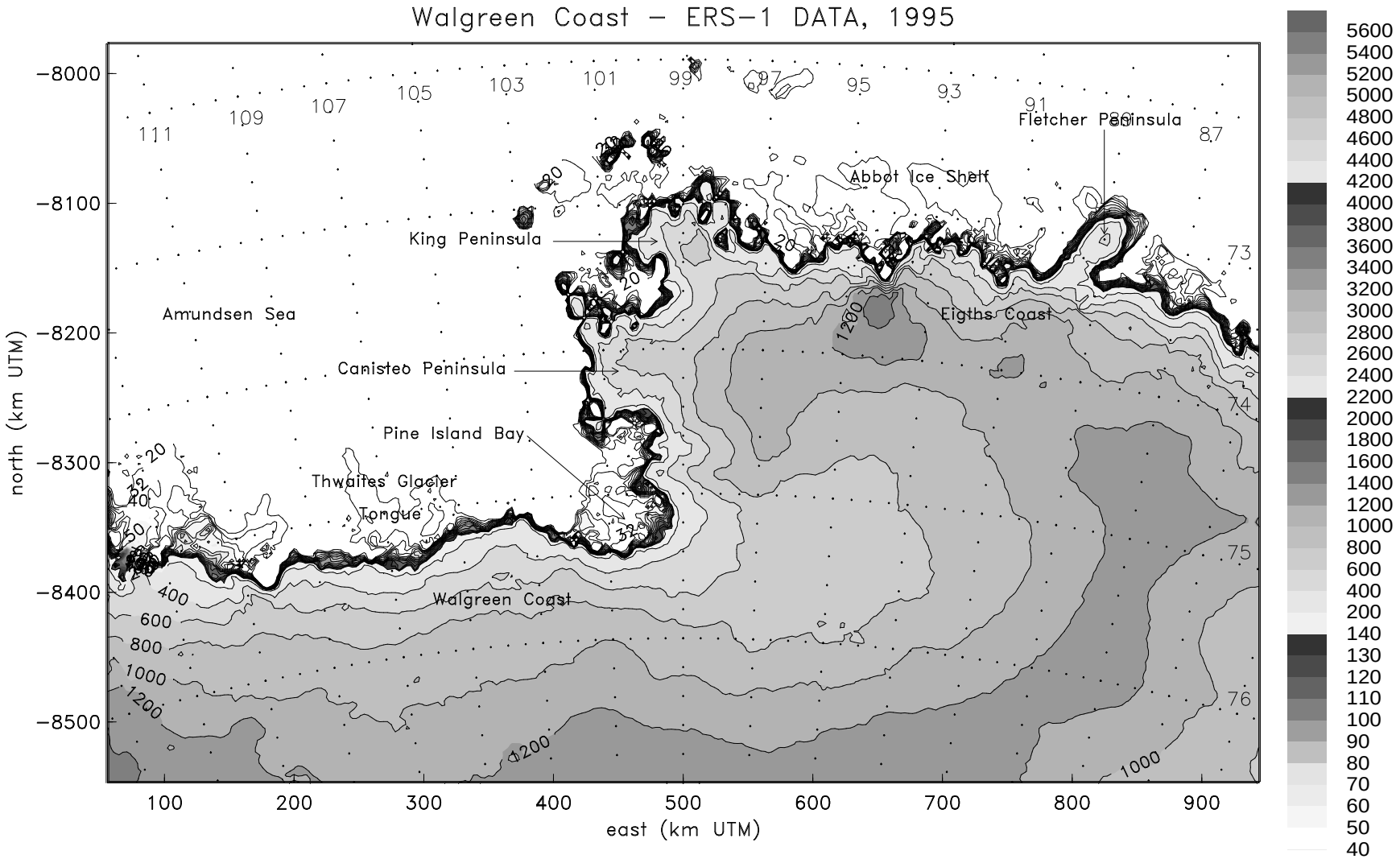
(4) EG&G, NASA/GSFC/Wallops Flight Facility, Wallops Island, Virginia

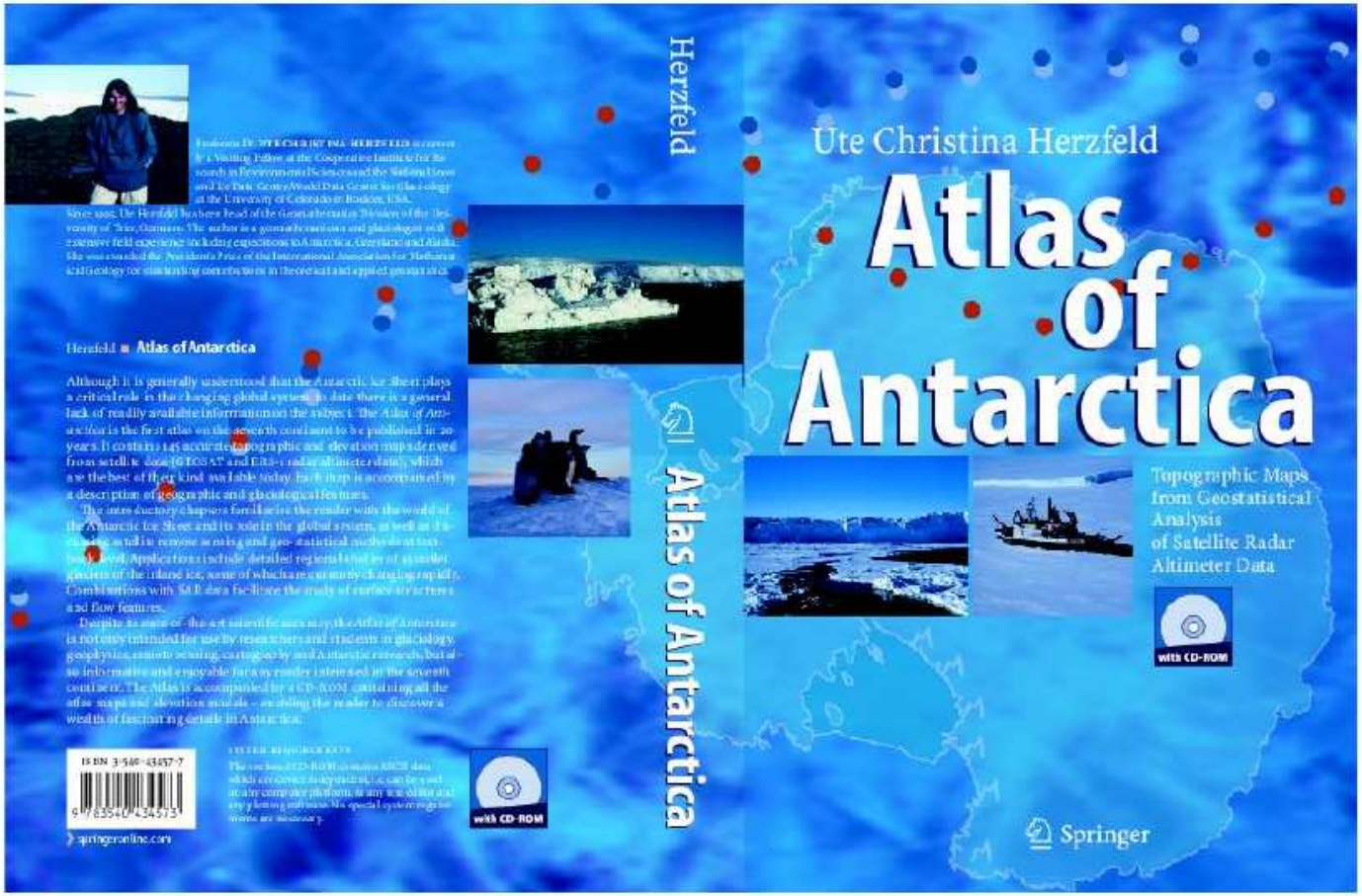
(5) Centro de Estudios Cientificos, Valdivia, Chile

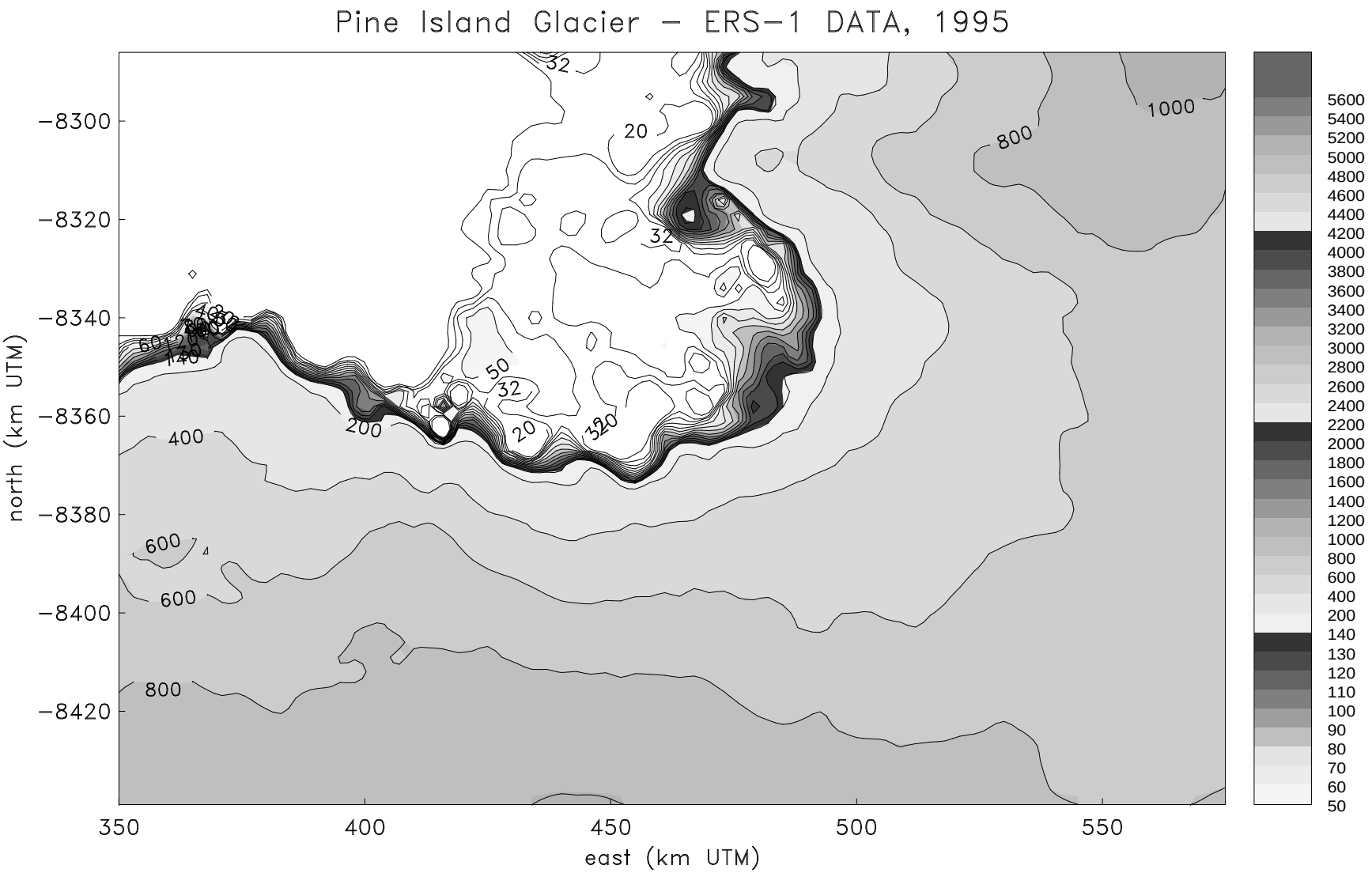
Antarctic Atlas Mapping Scheme





e243–279n71–77, WGS84, Gaussian variog., central mer. 261, slope corrected, scale 1:5000000, 980112


Herzfeld
Atlas of Antarctica
Ute Christina Herzfeld
Atlas of Antarctica
Topographic Maps from Geostatistical Analysis of Satellite Radar Altimeter Data
with CD-ROM
Springer
Herzfeld ■ Atlas of Antarctica
with CD-ROM



m261e243 279n71 77.e.smallpine2.atlasstyle.contps 20050404 submap of Atlas

The Role of Pine Island Glacier and Thwaites Glacier in Stability Scenarios for the West-Antarctic Ice Sheet

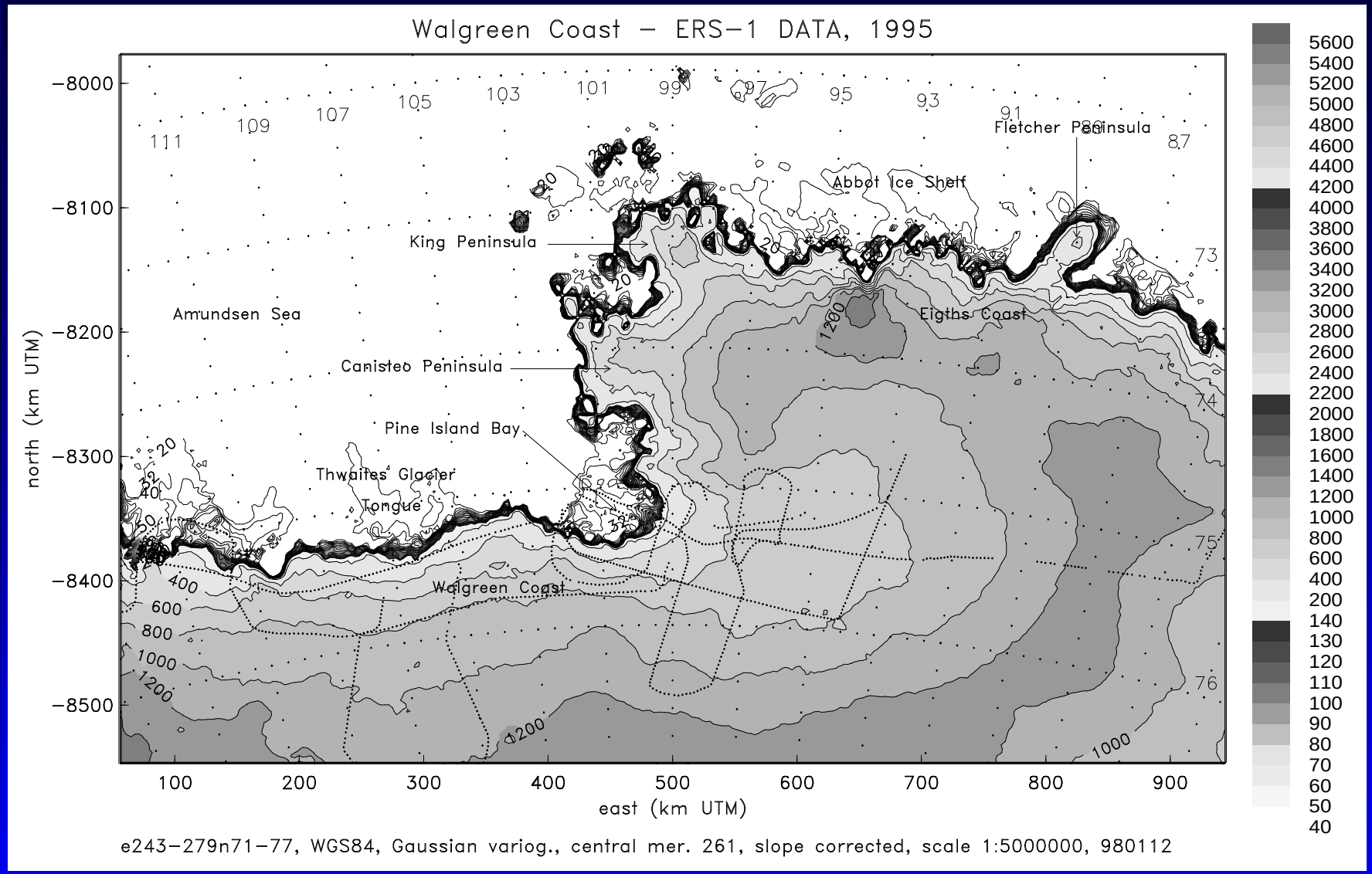
Altimeter Data Sources

(a) ERS-1 Satellite Radar Altimeter Data (01 Feb–01 Aug 1995)

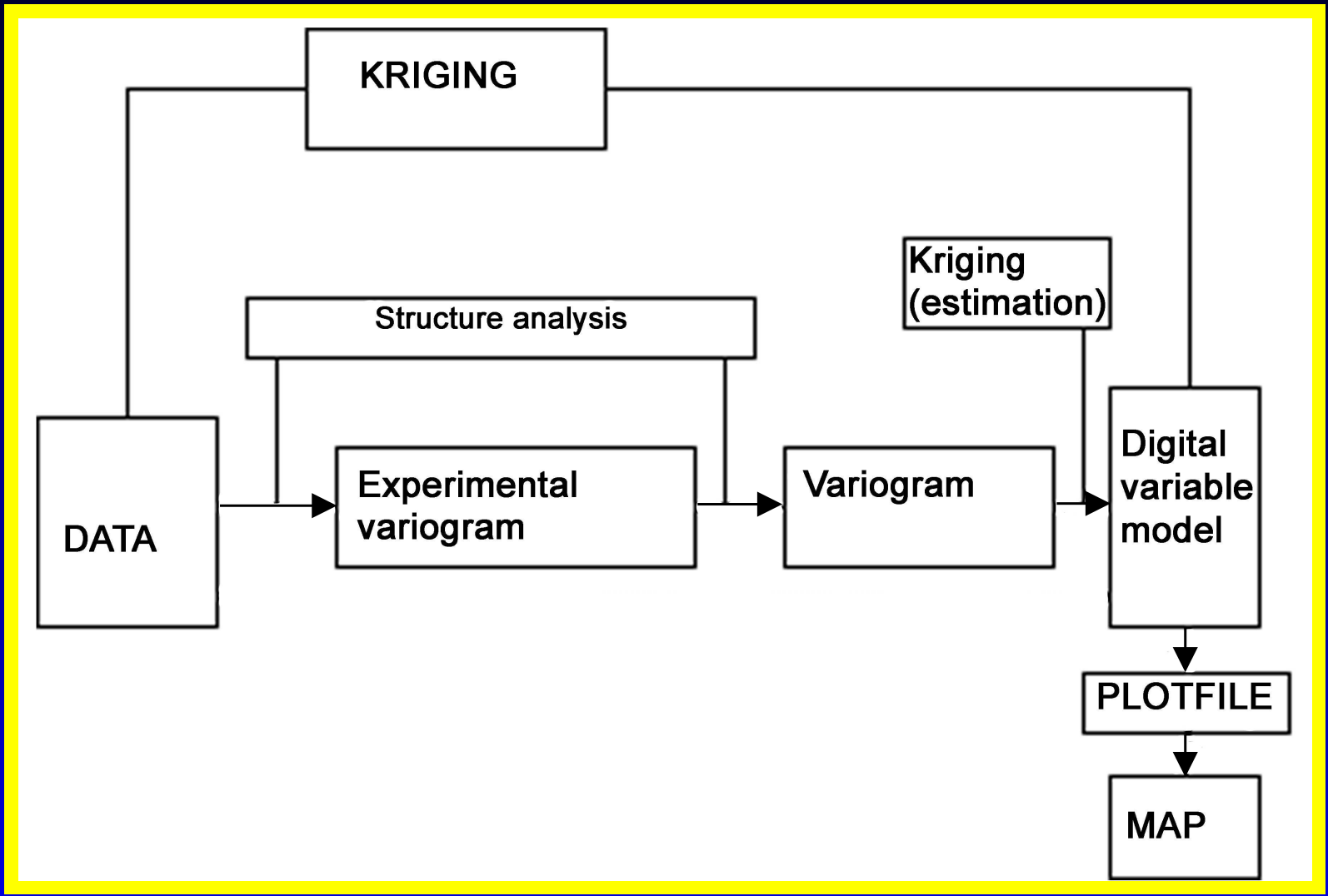
(b) Airborne Laser Altimeter Data (ATM Data) (2002-11-28, 12-04, 12-06, 12-12)

(c) ICESat GLAS Data (4 Oct–20 Nov 2003; Laser 2A)

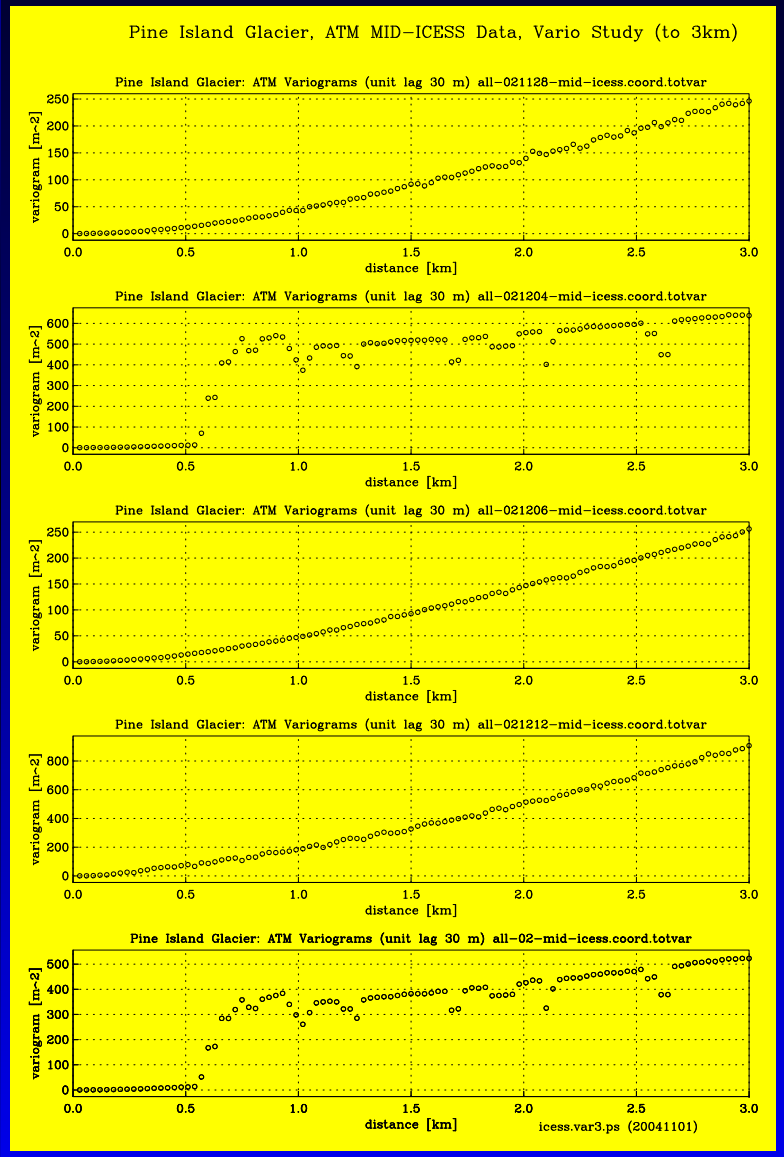
ATM Data Analysis: Track Map

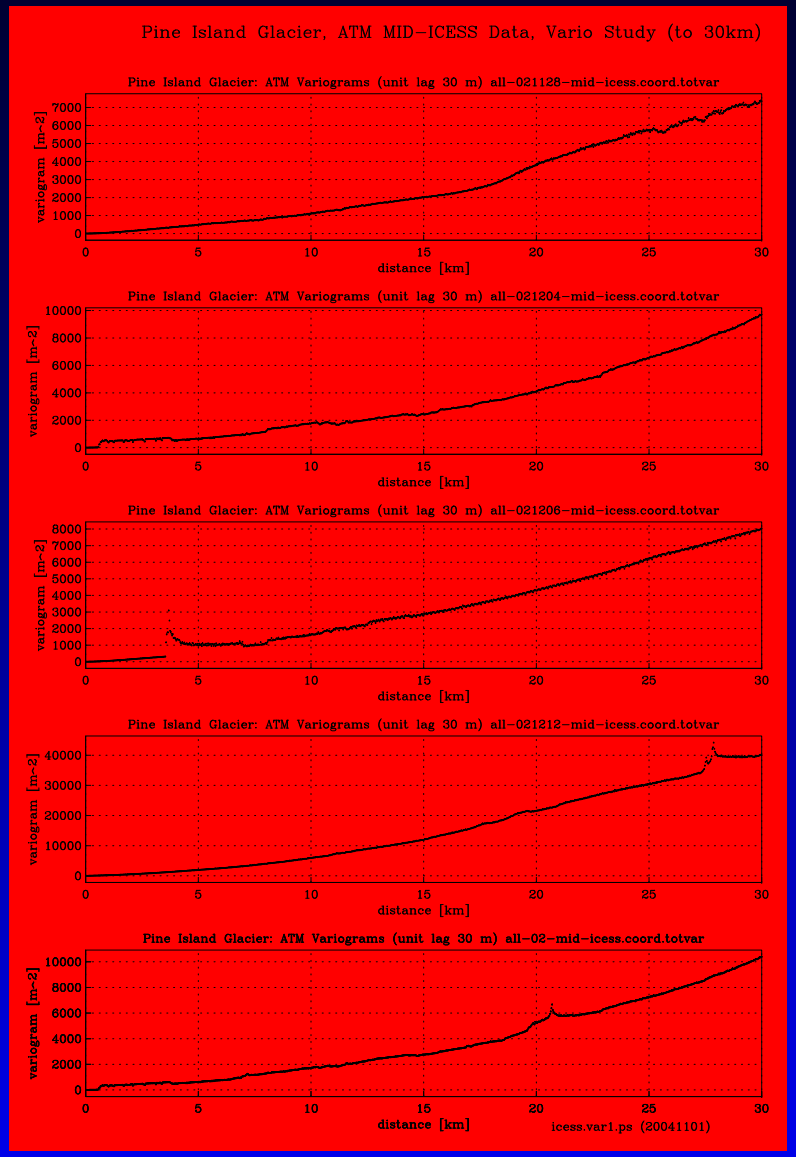


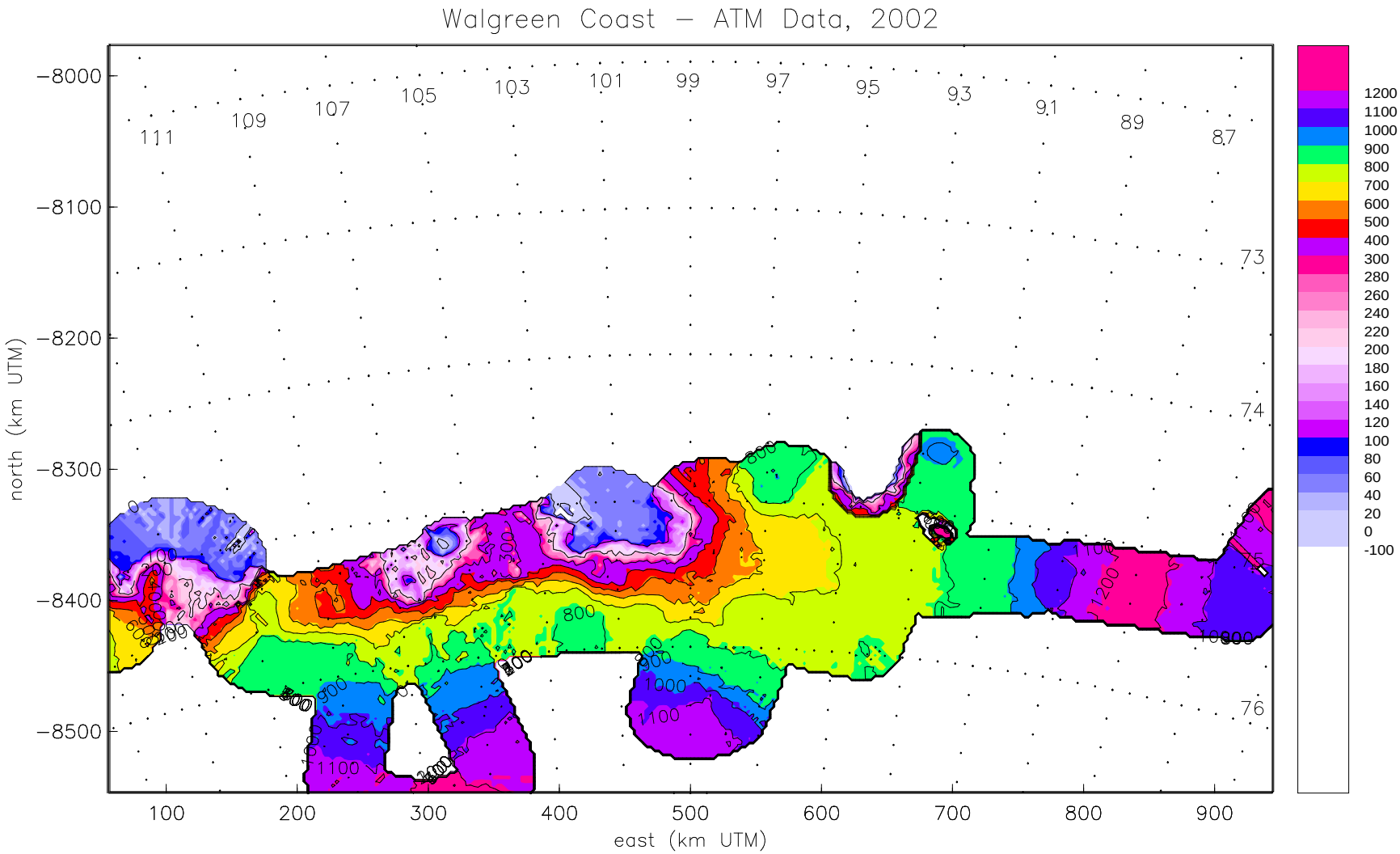
Kriging Flowdiagram



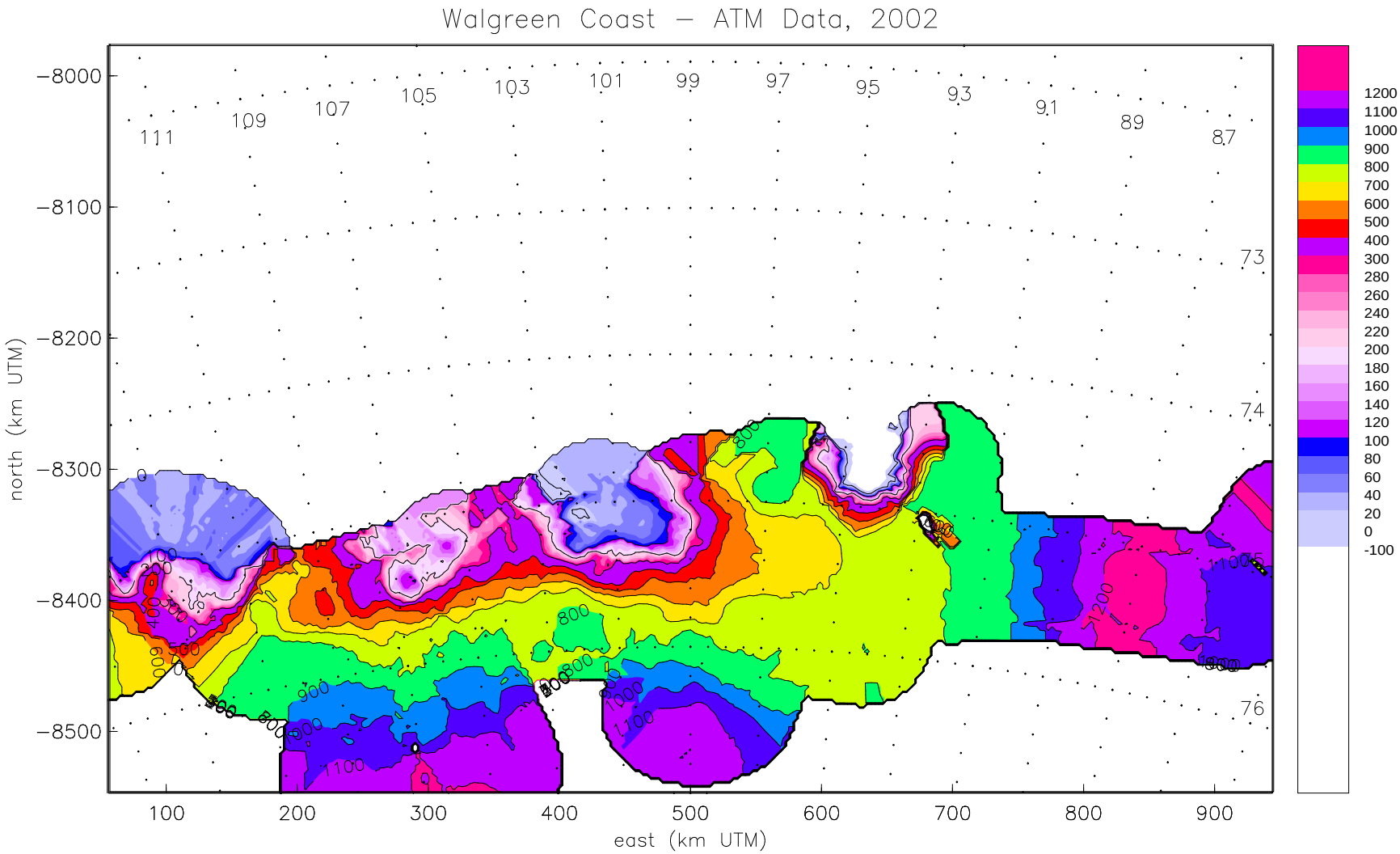
ATM Data Variography







m261e243–279n71–77, WGS84, Gau (nug=2,qrange=25km,qsill=6000), dsearch 30km, 1:5000000, 20050407
all–02–mid–icess–9.col8



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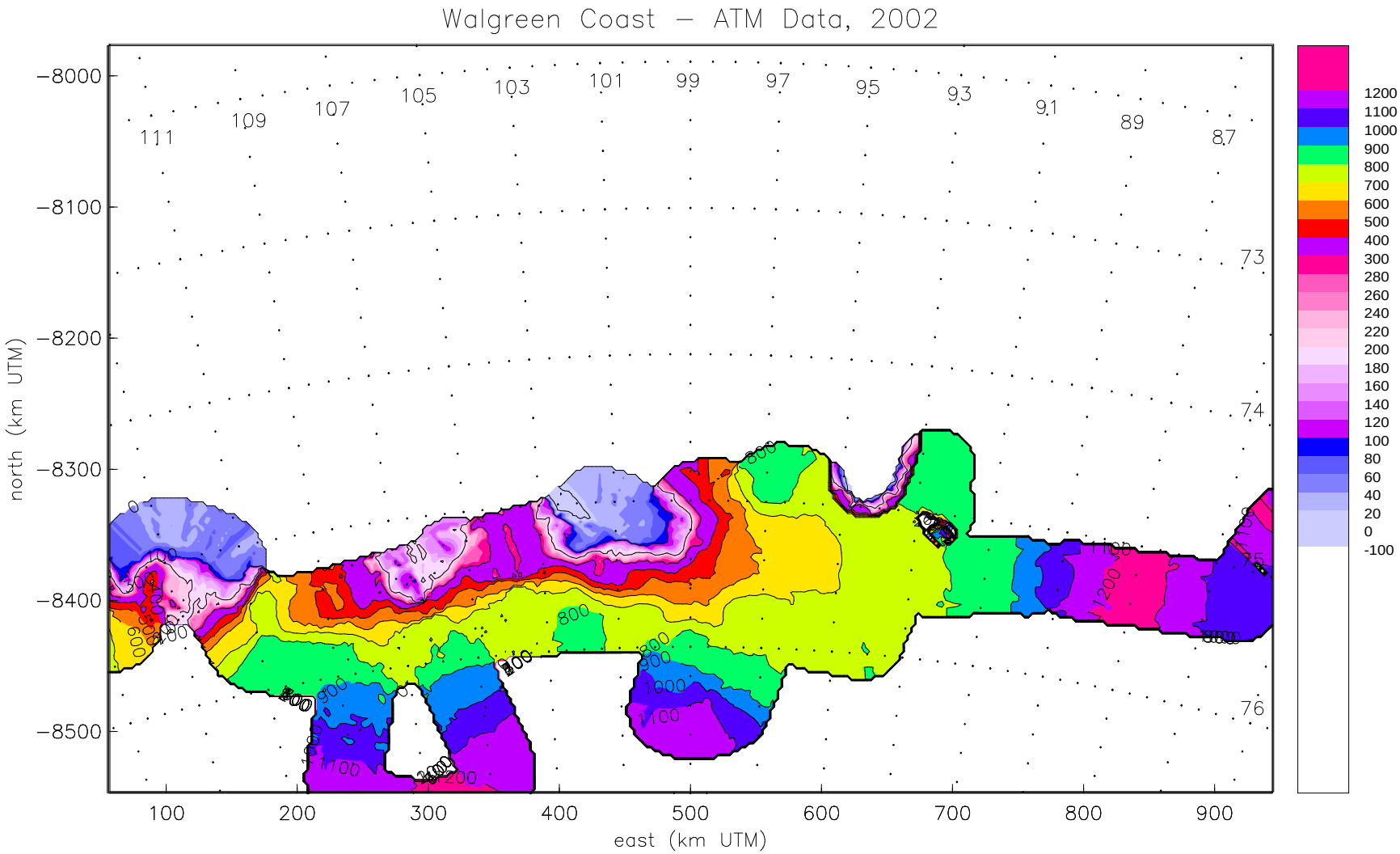

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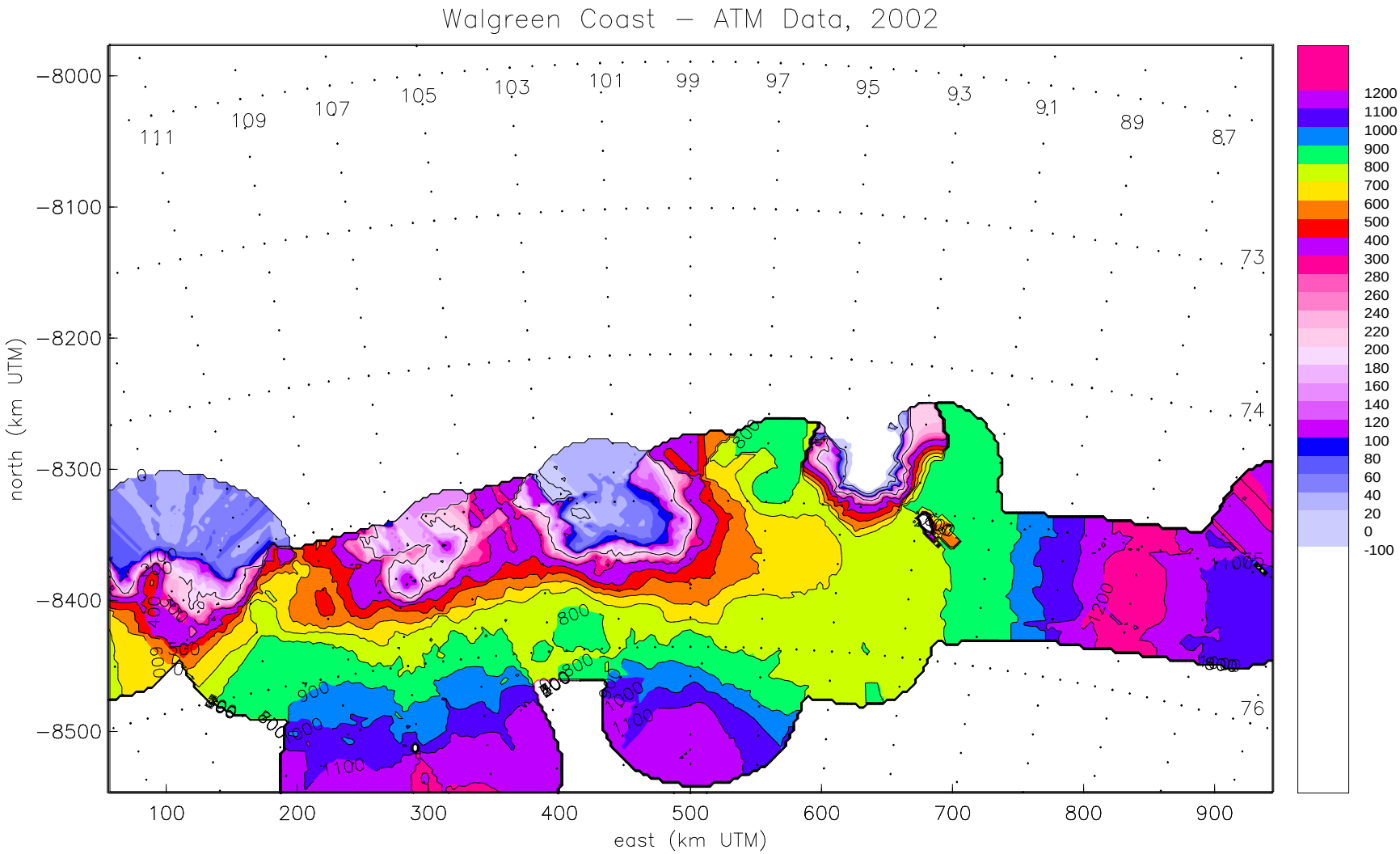

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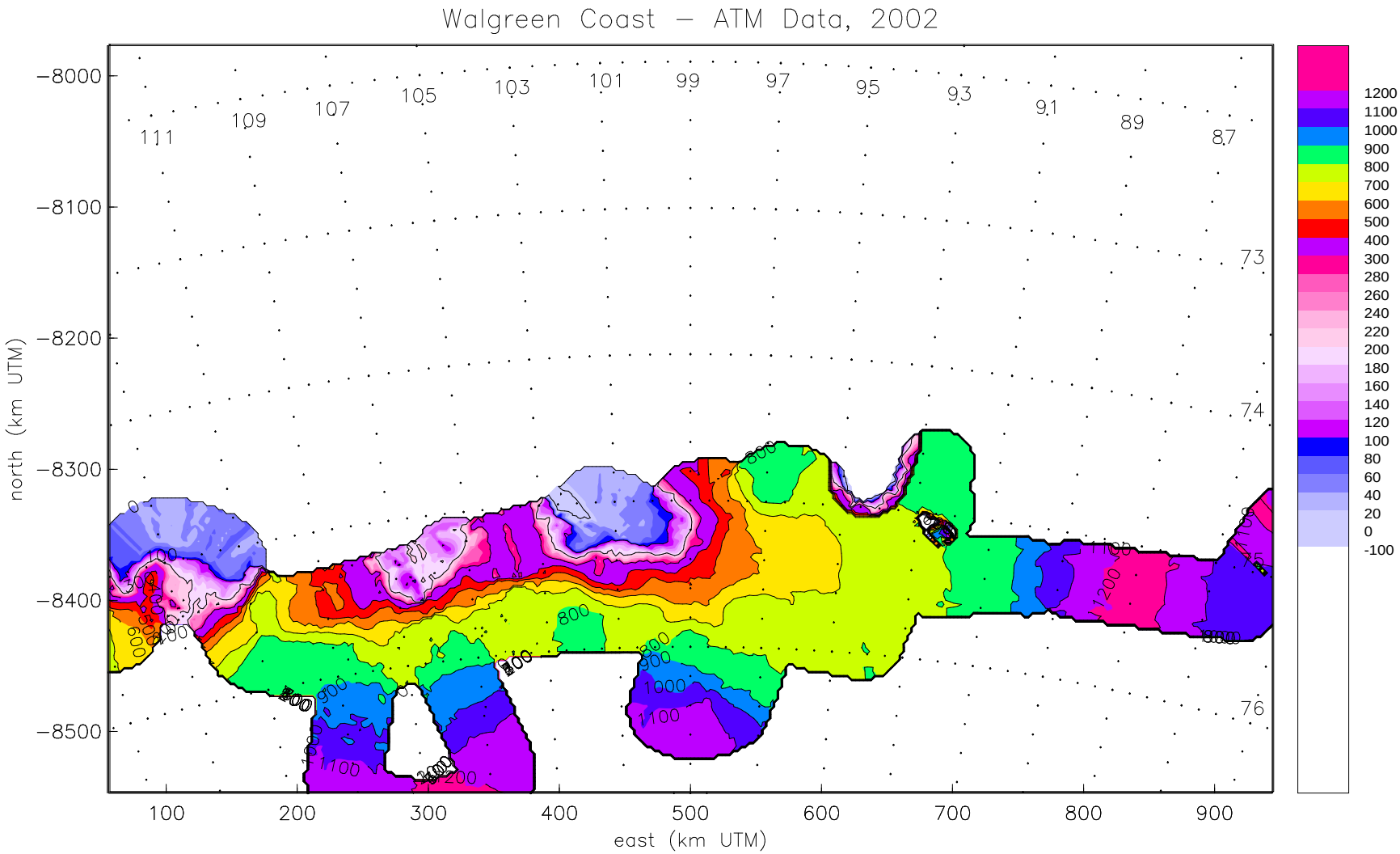
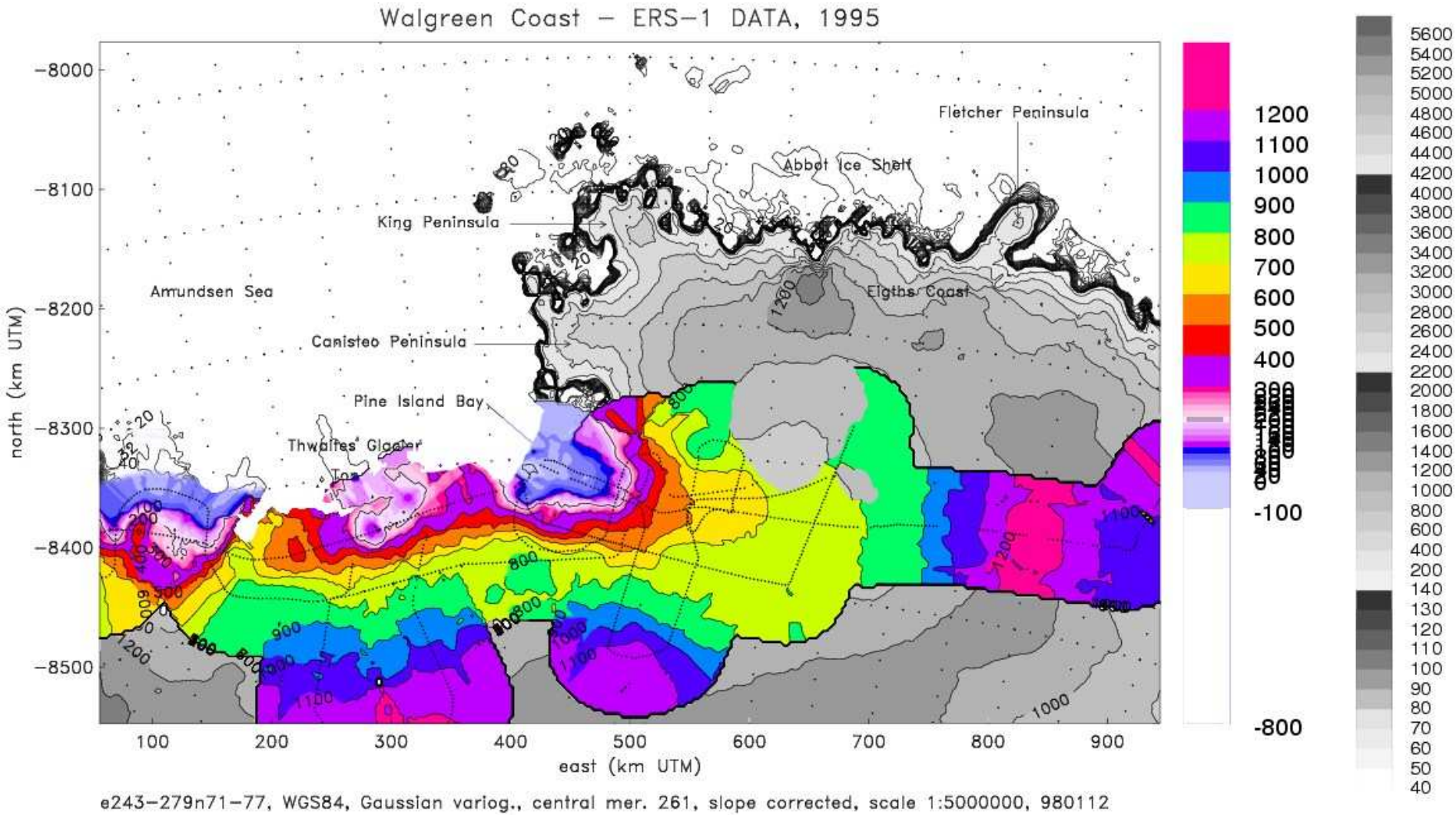
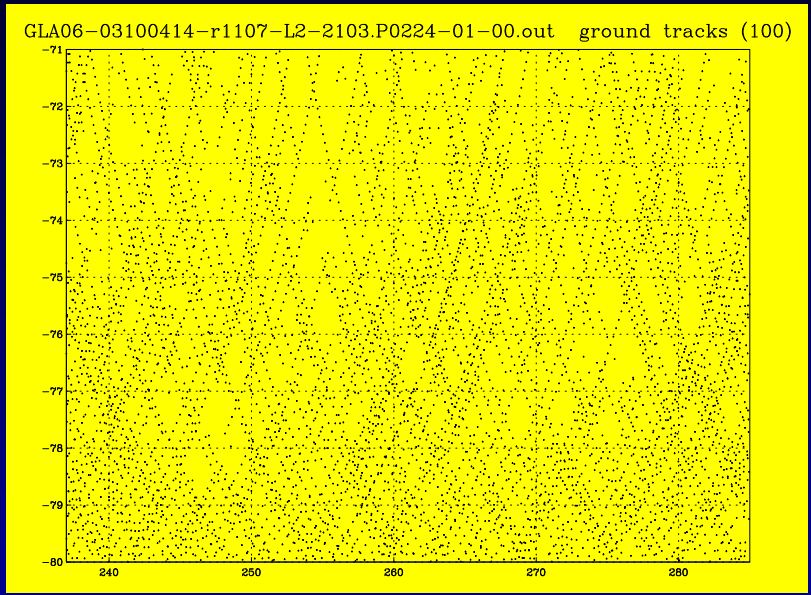


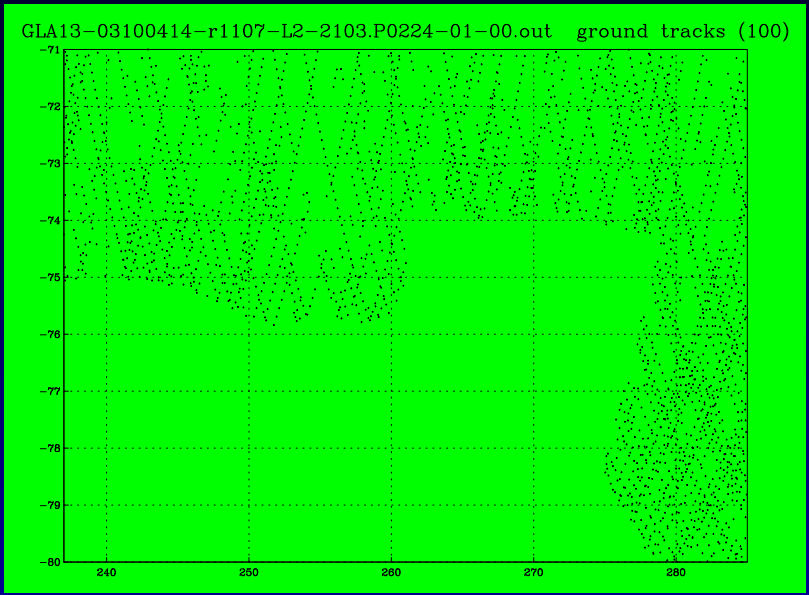
m261e243–279n71–77, WGS84, Gau (nug=500,qrg=25km,qsill=6000), qsearch 30km (16pts) 10km (8pts)
1:5000000, 20050407 all–02–mid–icess–20.col8

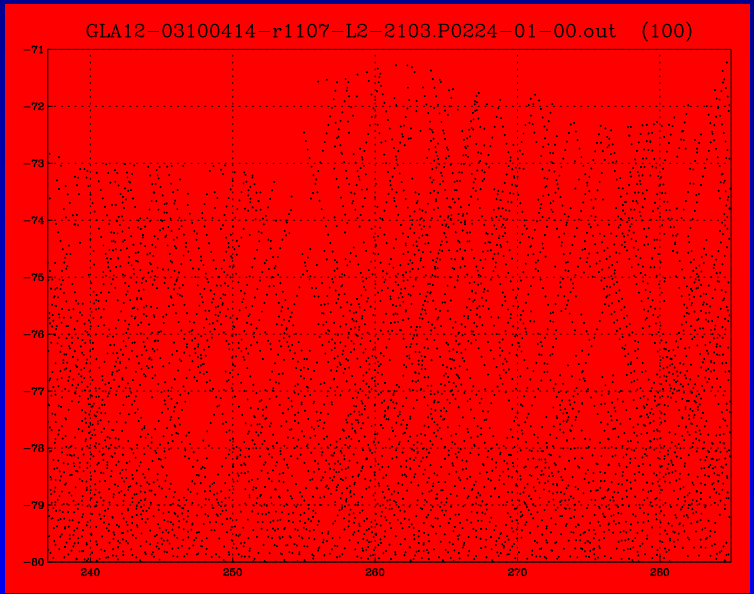
ATM data on ERS-1 Atlas

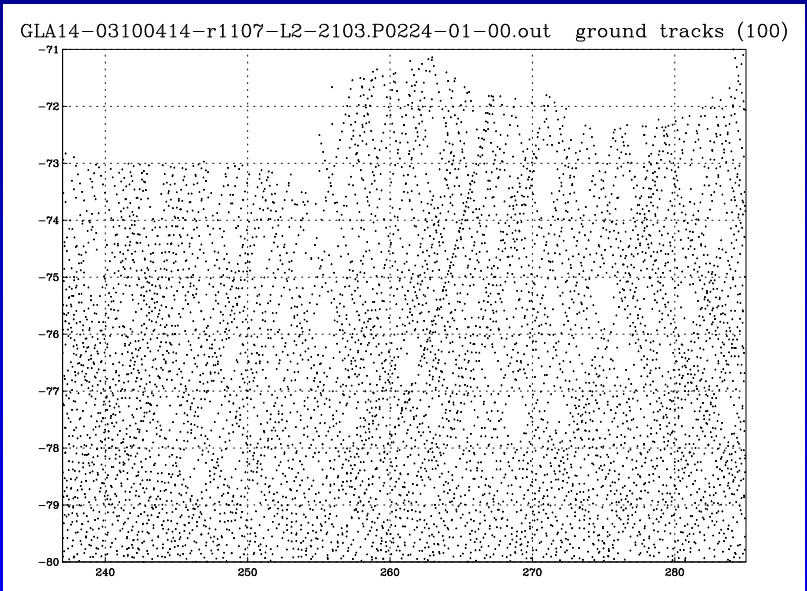


GLAS Data Analysis: Track Maps and Masks





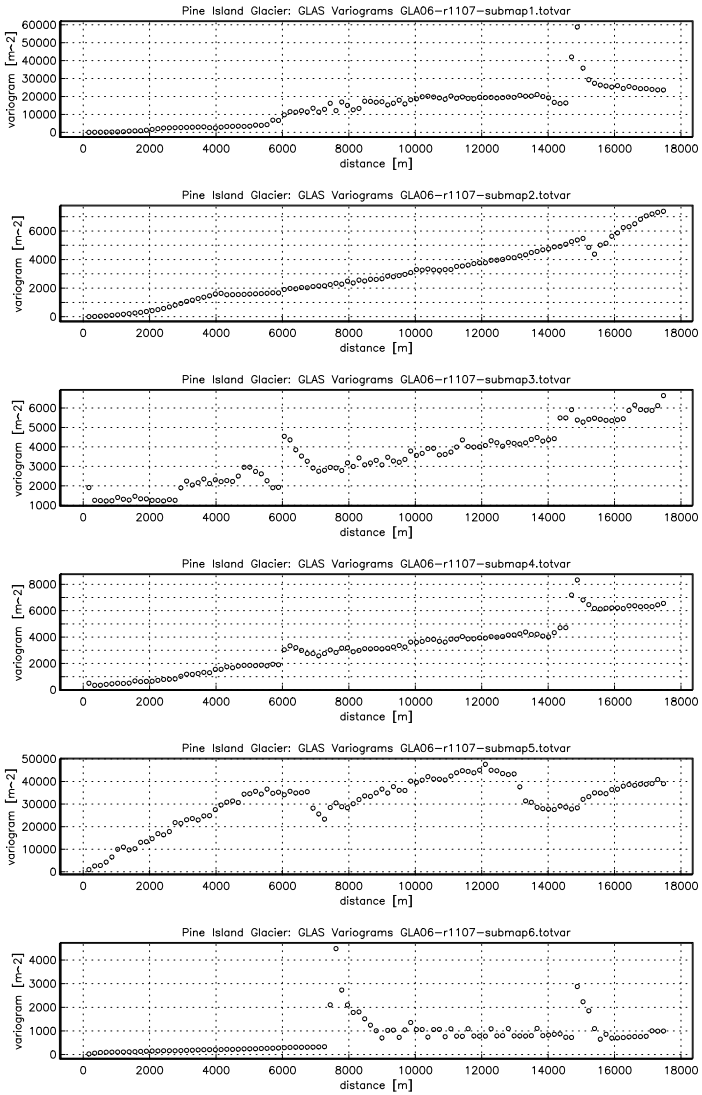




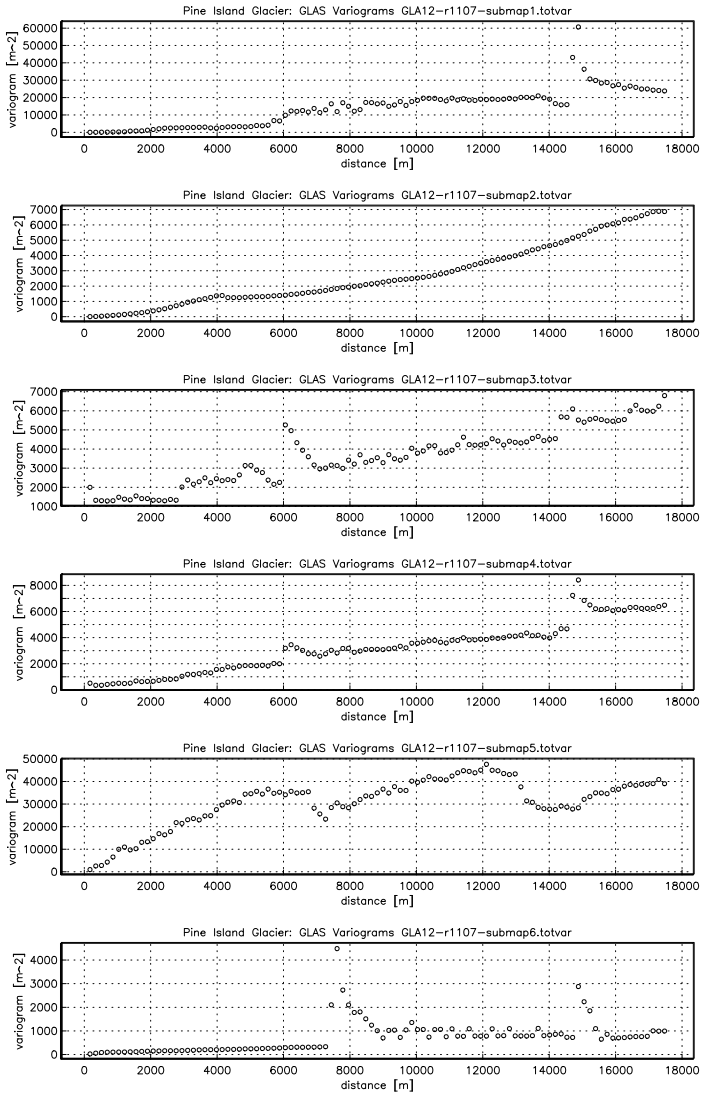
GLAS Data Variography

- (submap1) Pine Island Glacier, tongue and shelf
- (submap2) Lower Pine Island Glacier (inside 1)
- (submap3) Middle Pine Island Glacier
- (submap4) Pine Island Glacier Basin
- (submap5) Thwaites Glacier Basin
- (submap6) Lower Thwaites Gl, incl. tongue

GLA06



GLA12



(submap1) Pine Island Glacier, tongue and shelf

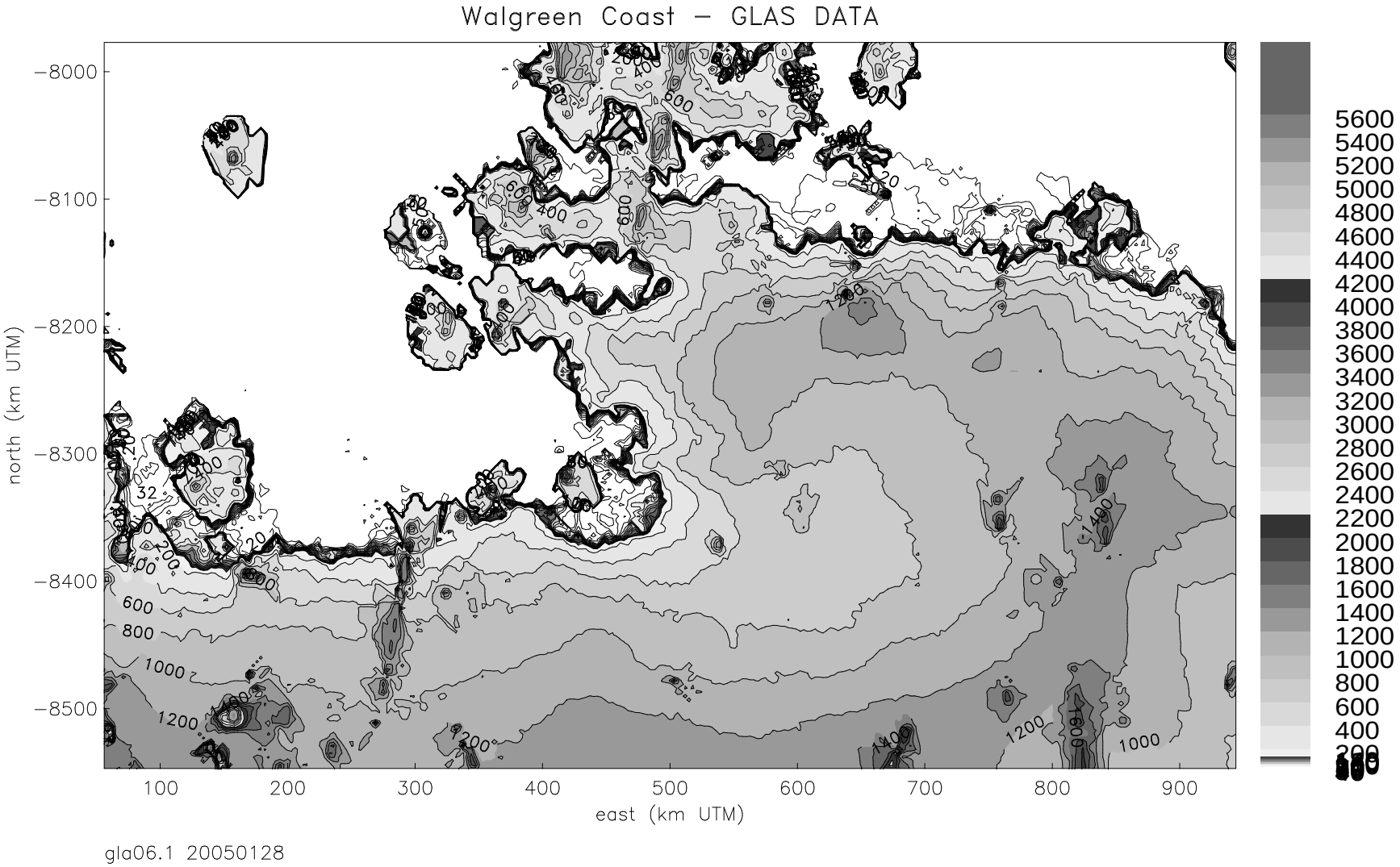
(submap2) Lower Pine Island Glacier (inside 1)

(submap3) Middle Pine Island Glacier

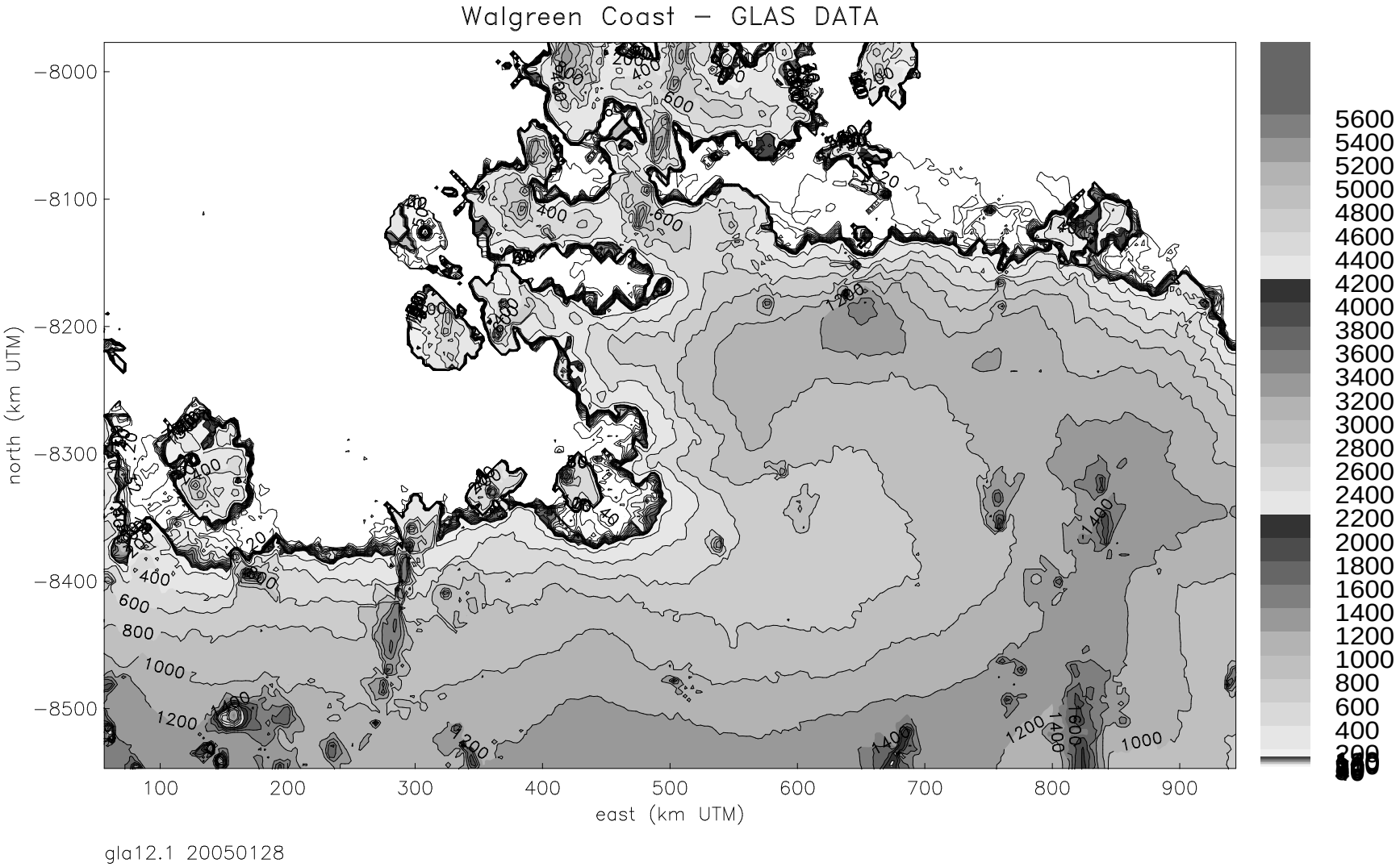
(submap4) Pine Island Glacier Basin

(submap5) Thwaites Glacier Basin

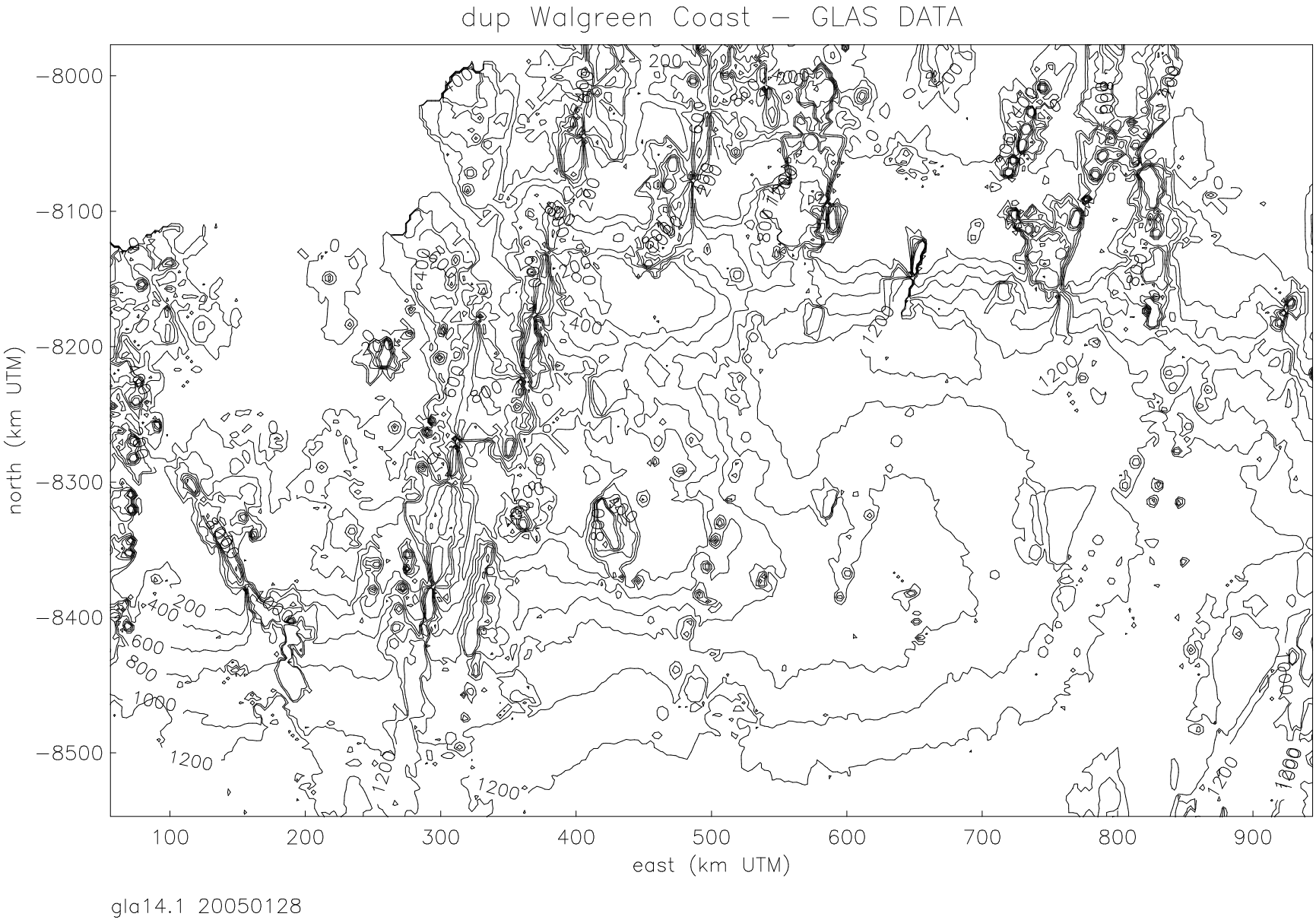
(submap6) Lower Thwaites Gl, incl. tongue



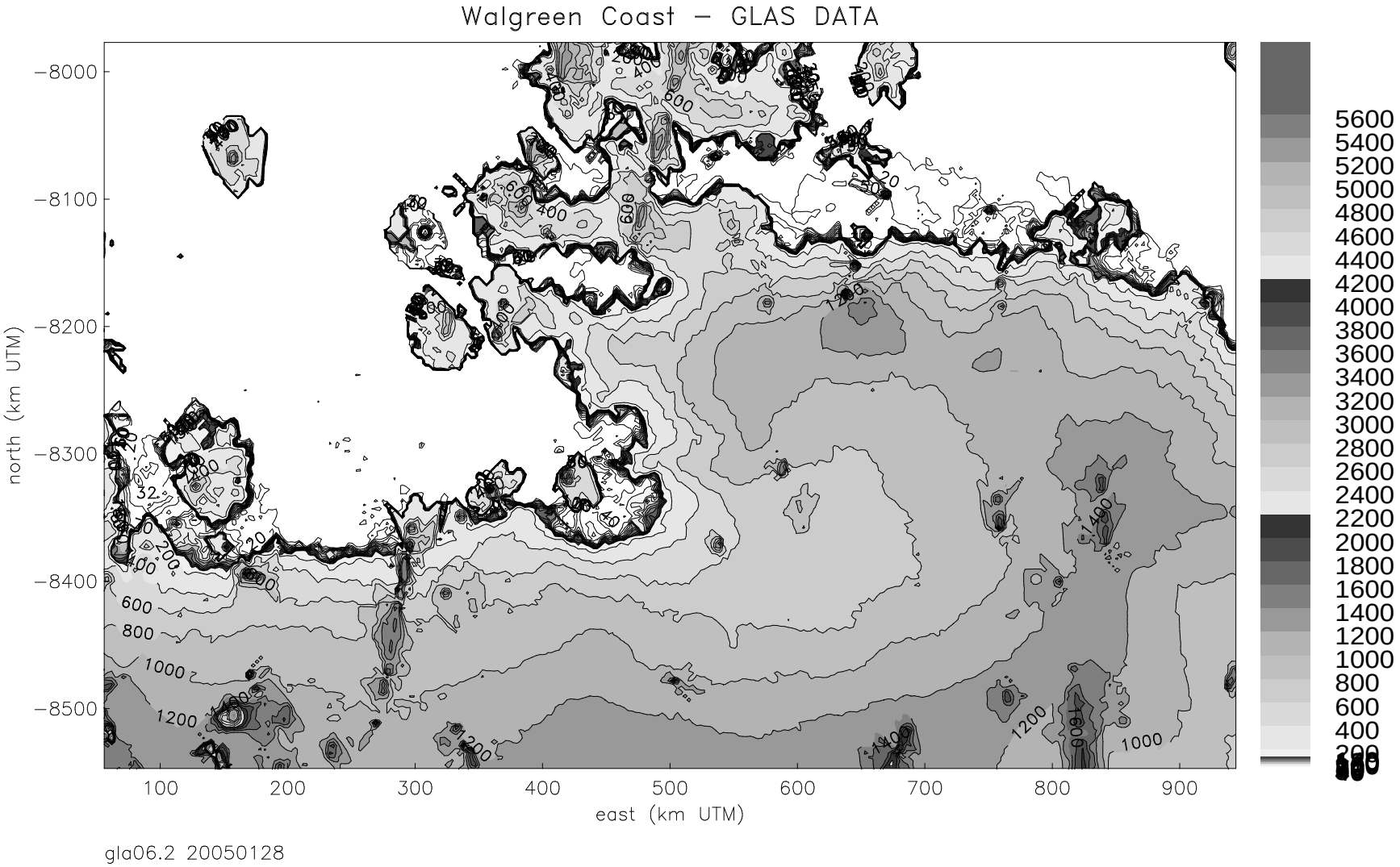
GLA06 (rel18, L2A) vario1(350,3450,6000m) search-rg 30km



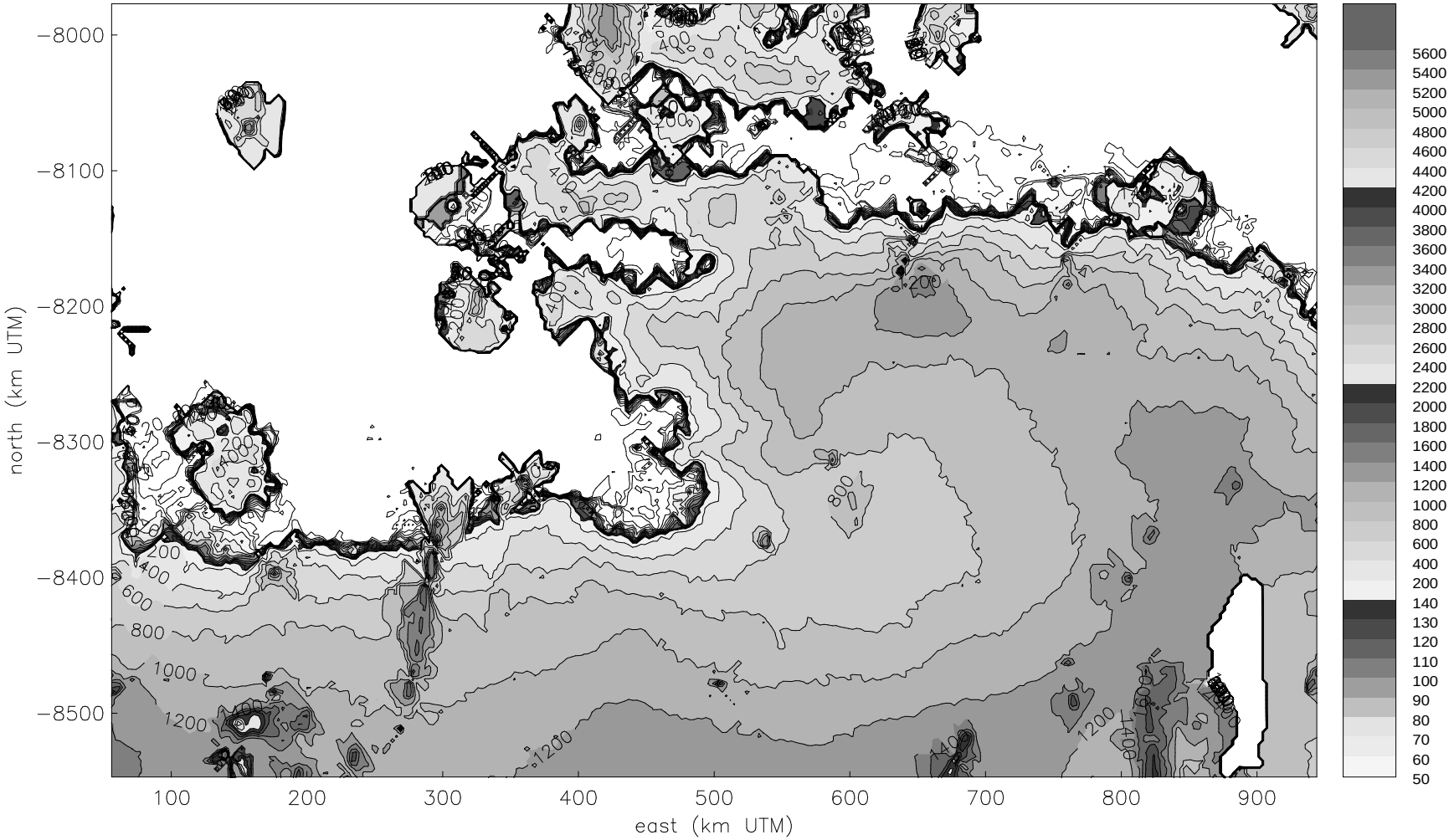
GLA012 (rel18, L2A) vario1(350,3450,6000m) search-rg 30km



GLA14 (rel18, L2A) vario1(350,3450,6000m) search-rg 30km



GLA06 (rel18, L2A) vario2(1000,35000,6000m) search-rg 30km

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gla06.last33days.trans
20050407
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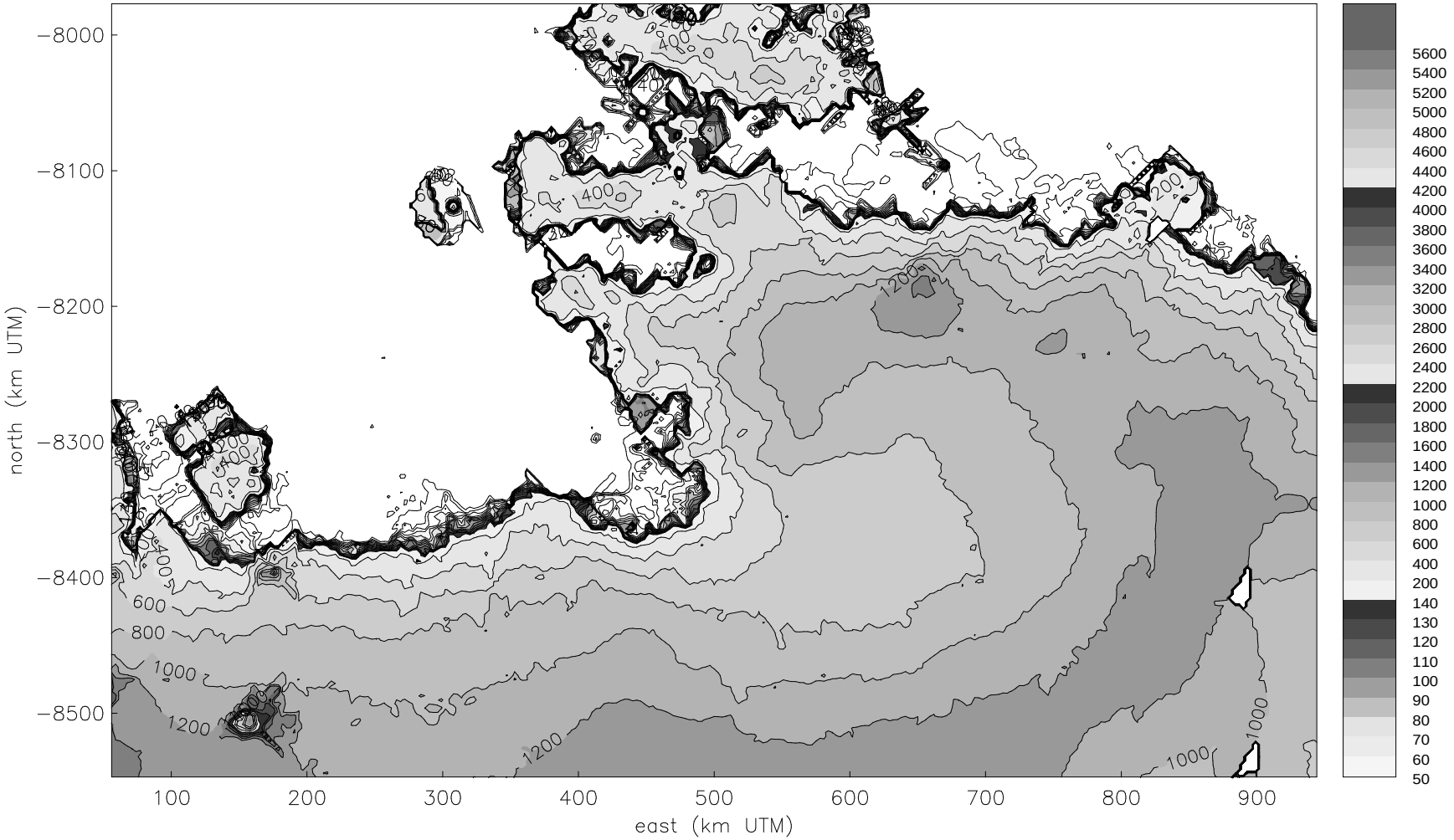
GLA06 (rel18, L2A, last33days) vario1(350,3450,6000m) search-rg 30km

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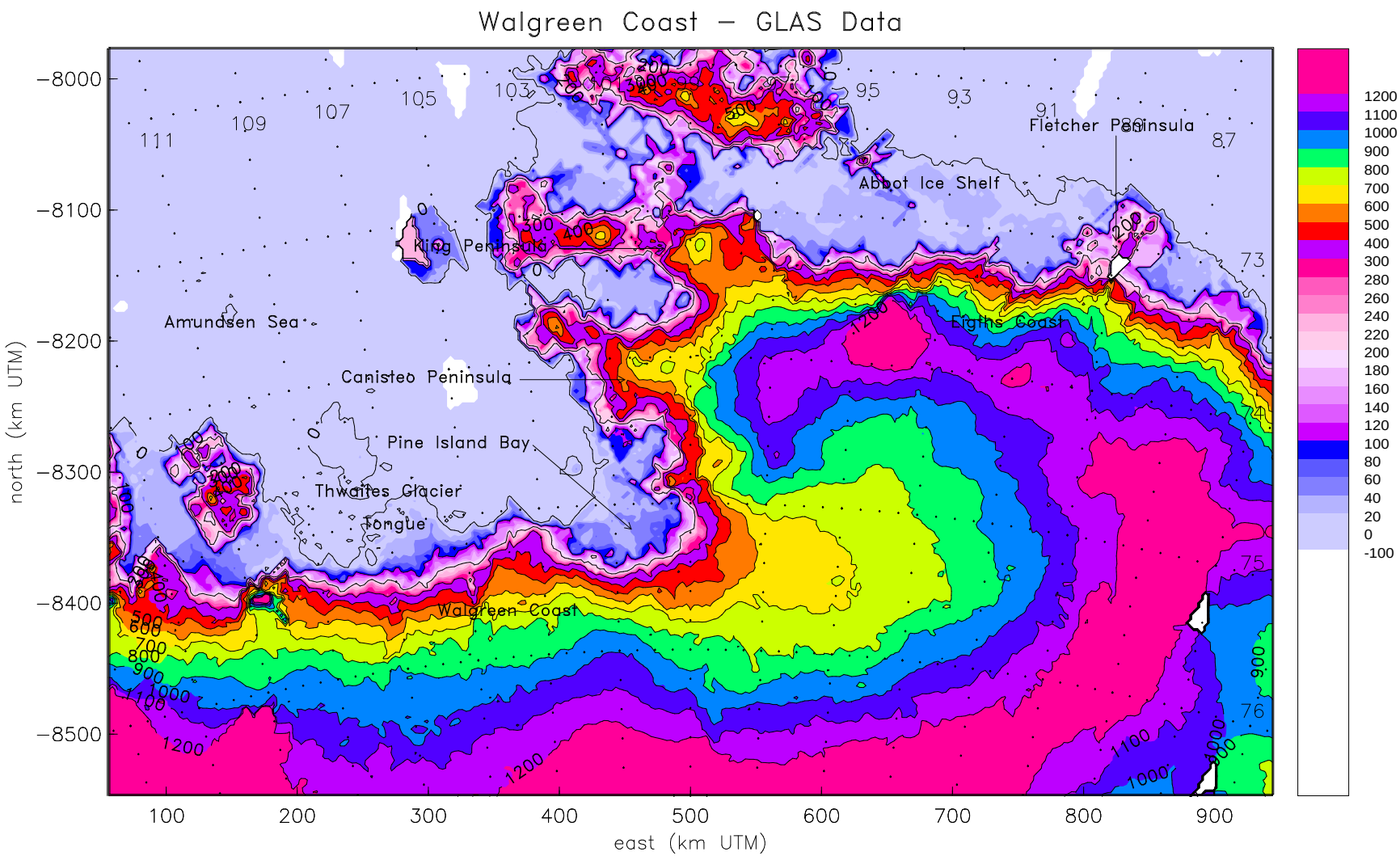
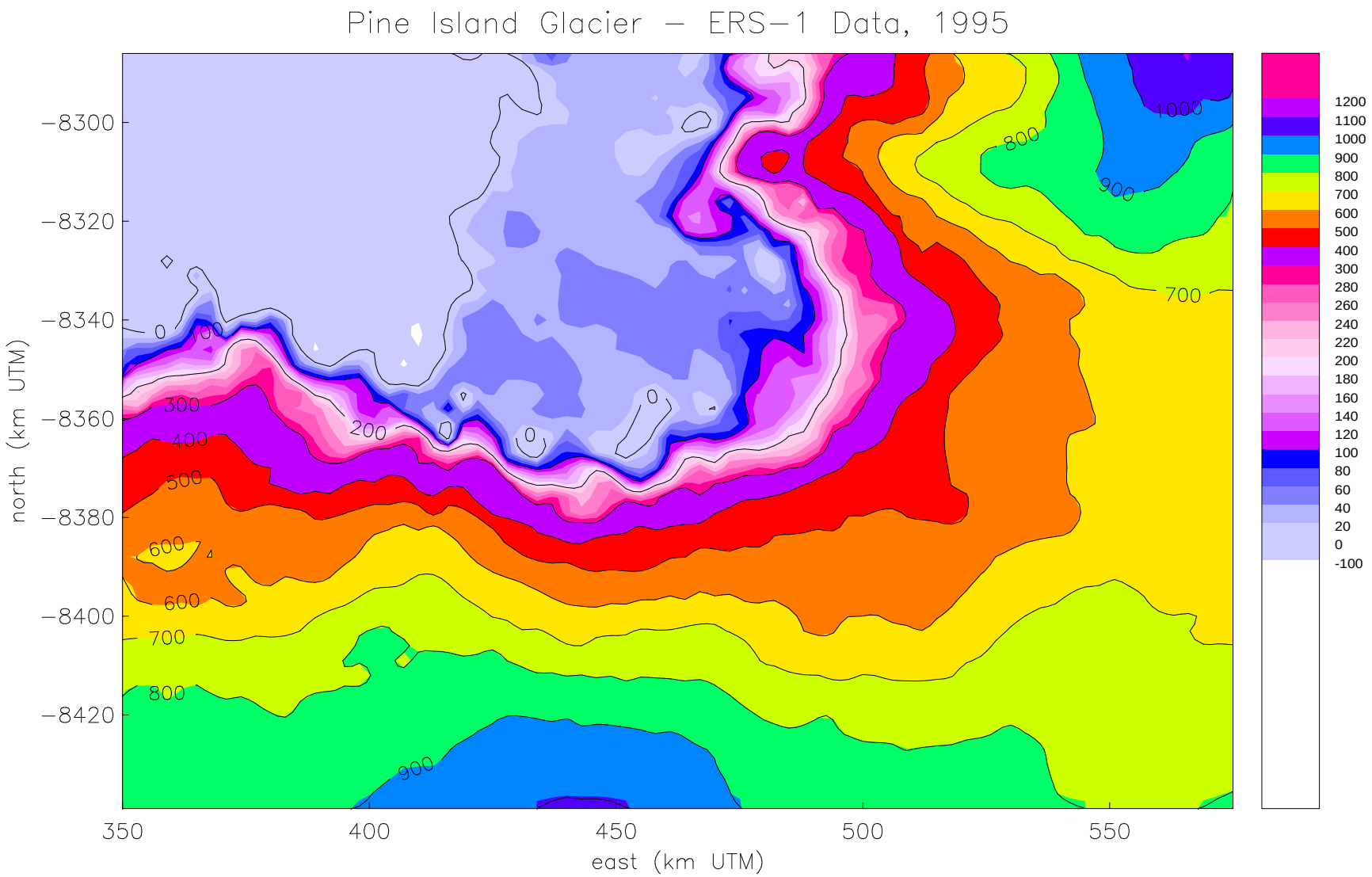
GLA06 (rel18, L2A, gain-crit) vario1(350,3450,6000m) search-rg 30km



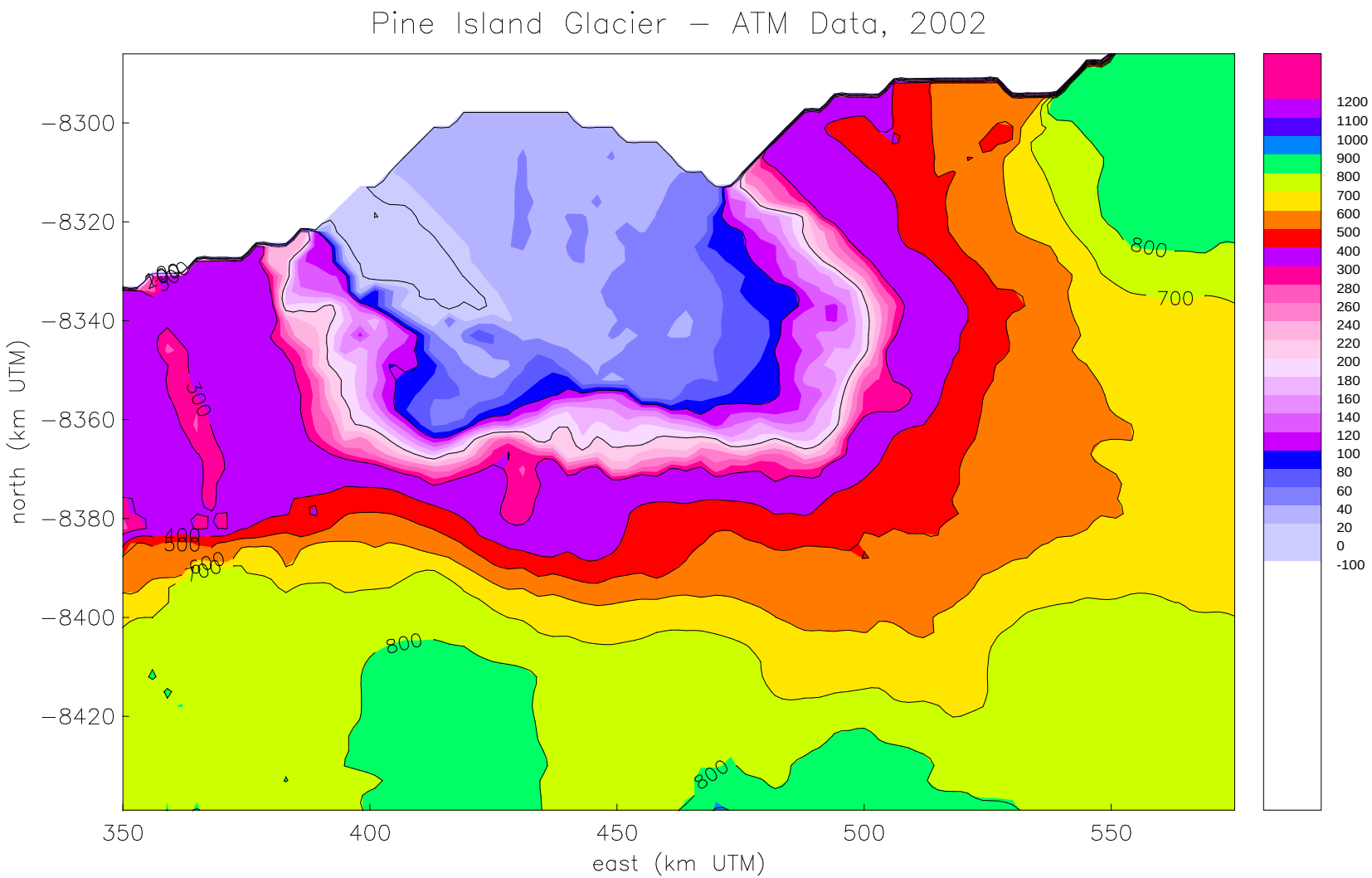
GLA06 Data, (Laser 2A, gain−crit, rel18), Oct/Nov 2003, vario(350,3450,6000m), search−rg 30km, 1:5000000, gla06.1.gain.v3.col8

Now we can study elevation changes

in Pine Island Glacier and Thwaites Glacier!



m261e243–279n71–77.e.smallpine2.col8 20050407



e350−575s8439−8286utm, central mer. 261, WGS84, ATM Data Nov/Dec 2002 1:2000000
Gaussian vario (500,6000,25km), 30km extrapolation, 20050321
all−02−mid−icess−20.smallpine2.col8

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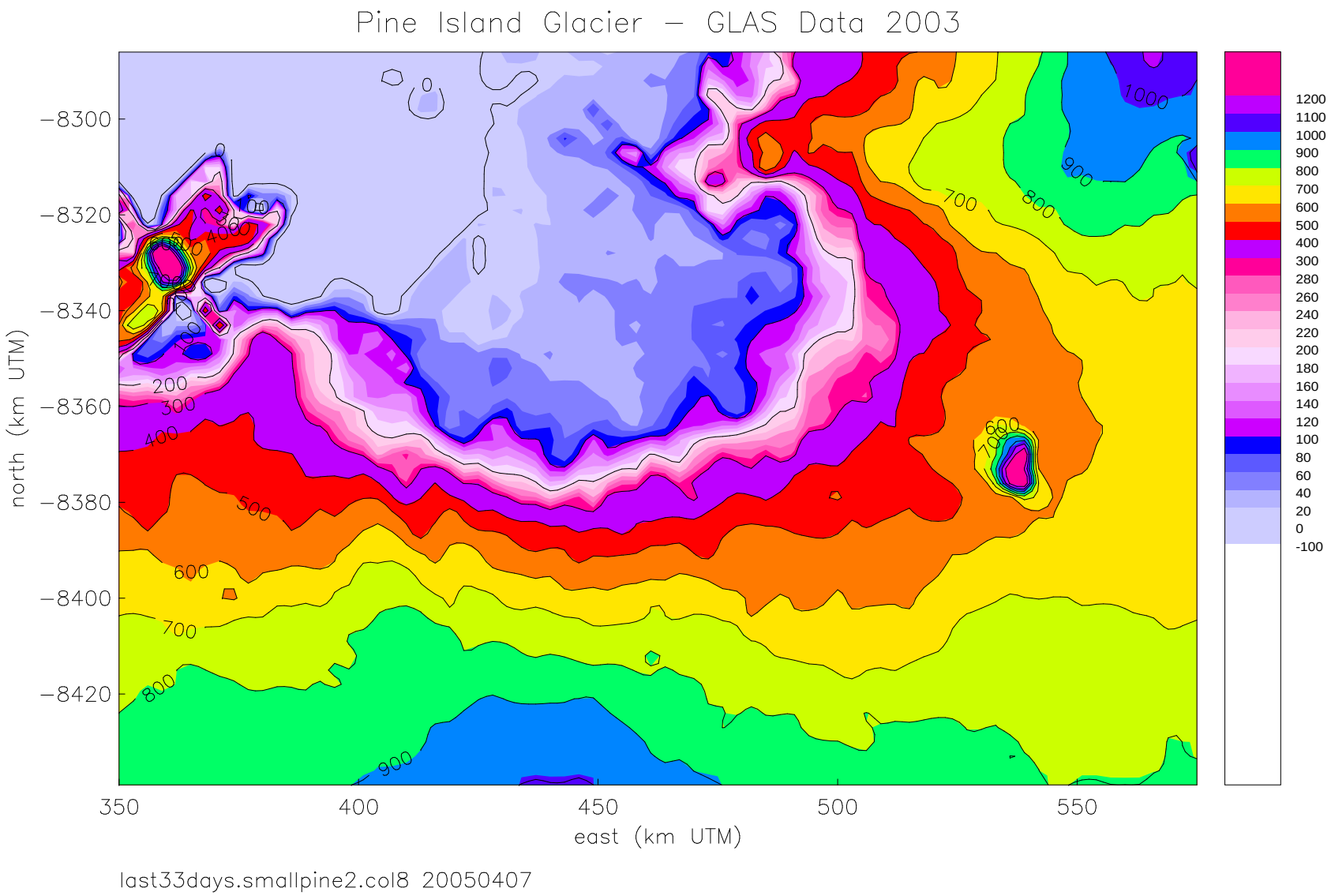
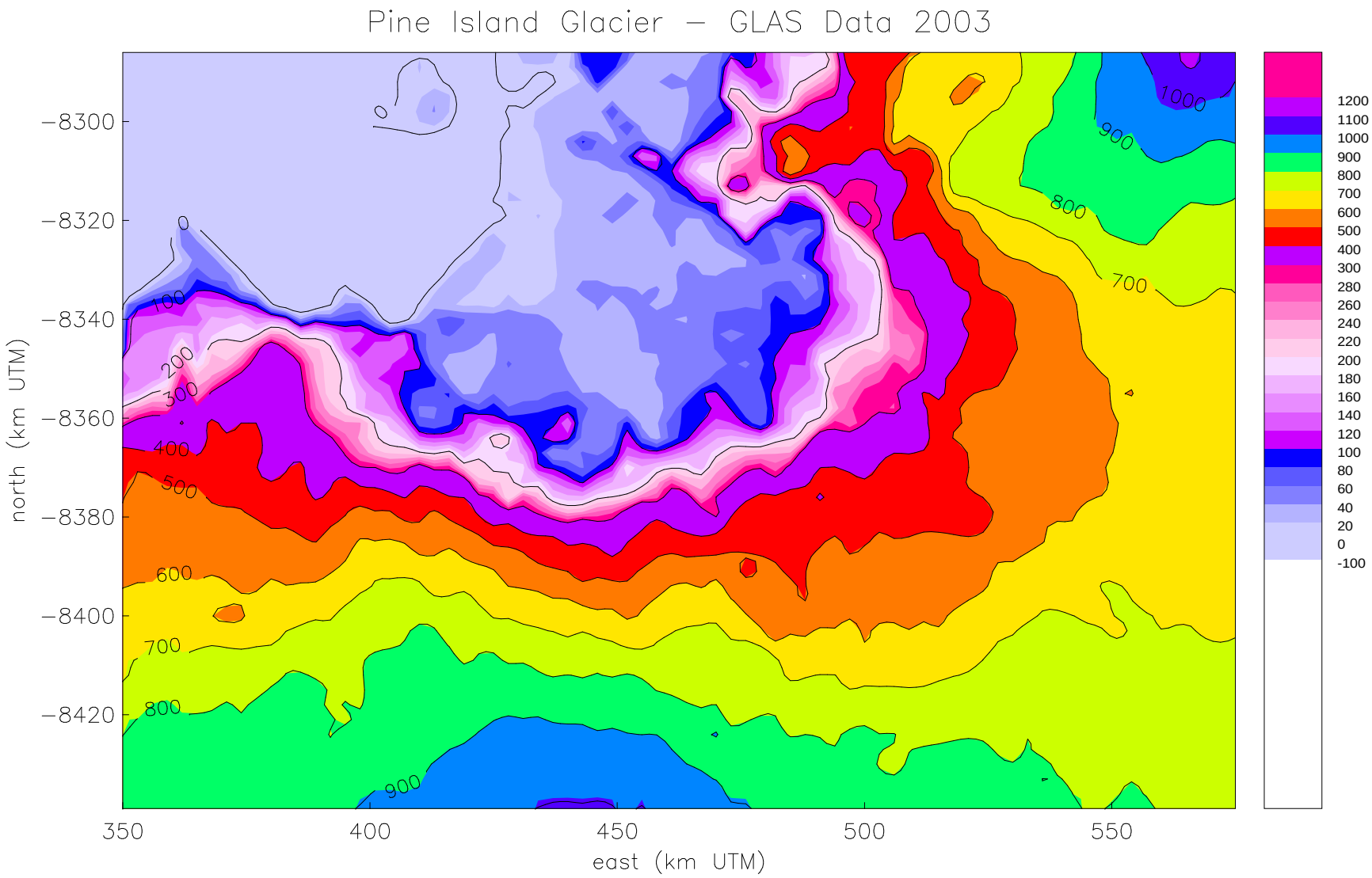
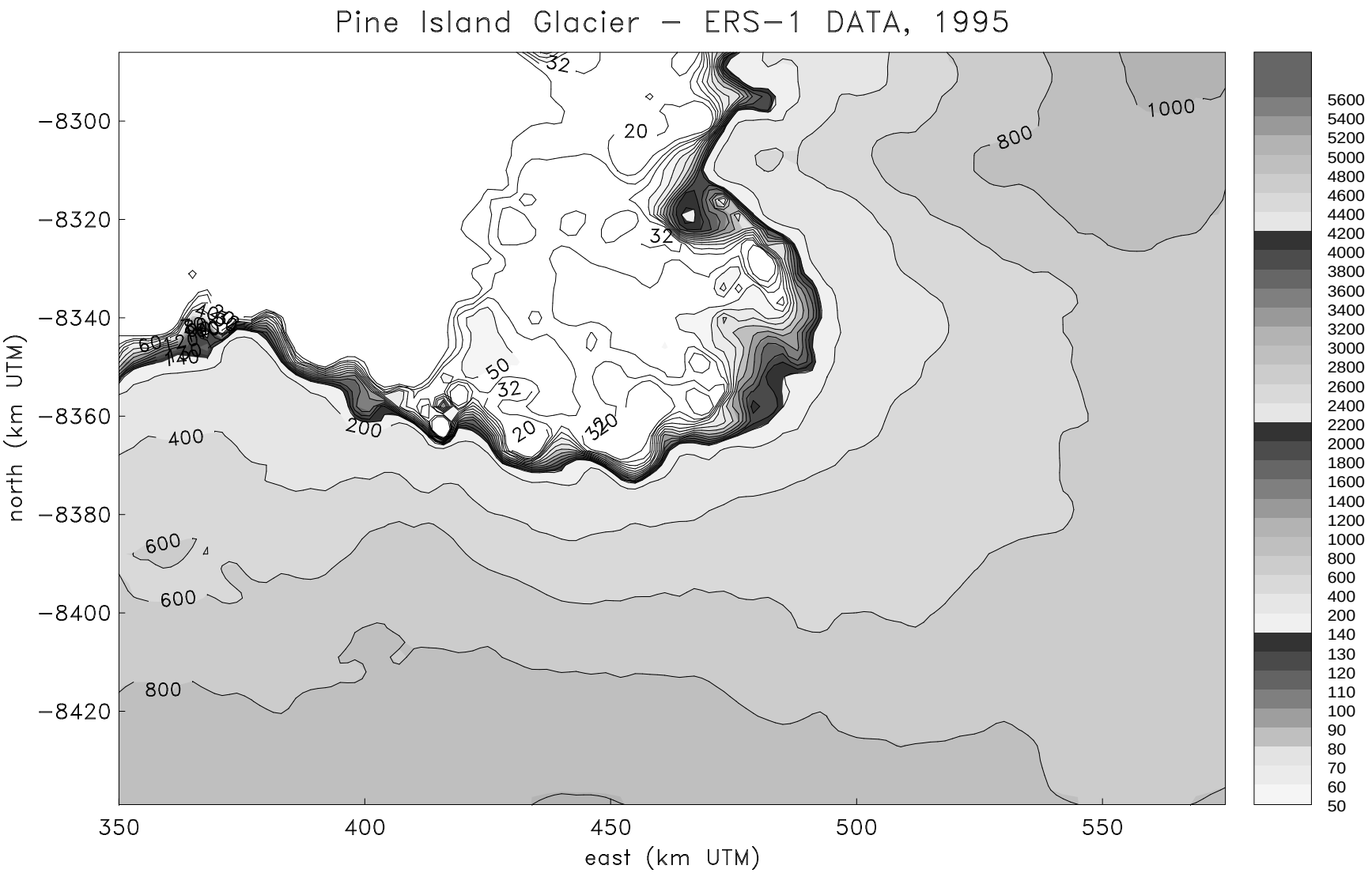
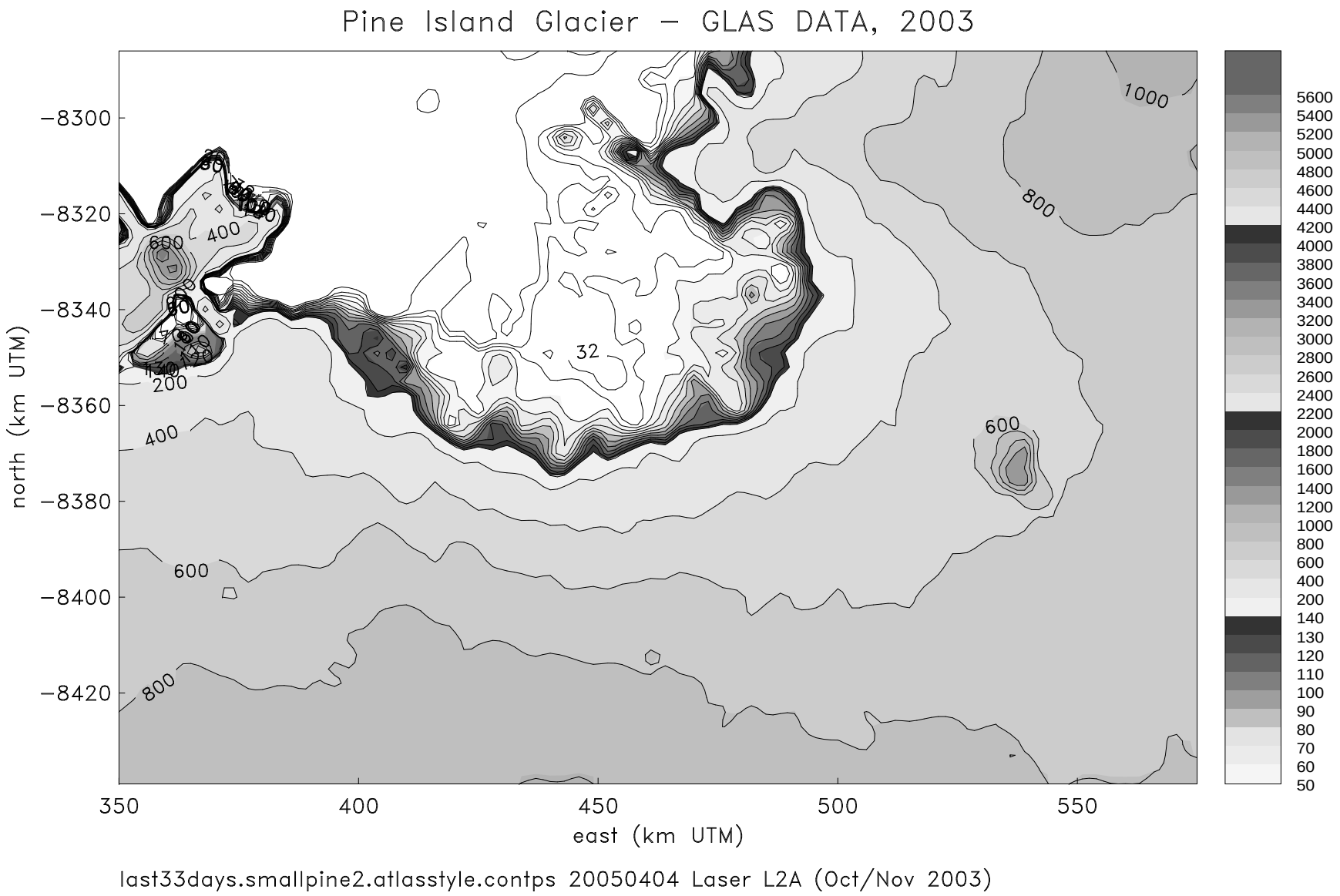


inuni last33days.dat 20050225


Pine Island Glacier – GLAS Data 2003
north (km UTM)
east (km UTM)
−8300
−8320
−8340
−8360
−8380
−8400
−8420
350
400
450
500
550
0
100
200
300
400
500
600
700
800
900
1000
1200
1100
1000
900
800
700
600
500
400
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
-100



m261e243 279n71 77.e.smallpine2.atlasstyle.contps 20050404 submap of Atlas


Pine Island Glacier – GLAS DATA, 2003
north (km UTM)
east (km UTM)
−8300
−8320
−8340
−8360
−8380
−8400
−8420
350
400
450
500
550
1000
800
600
400
200
32
5600
5400
5200
5000
4800
4600
4400
4200
4000
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3400
3200
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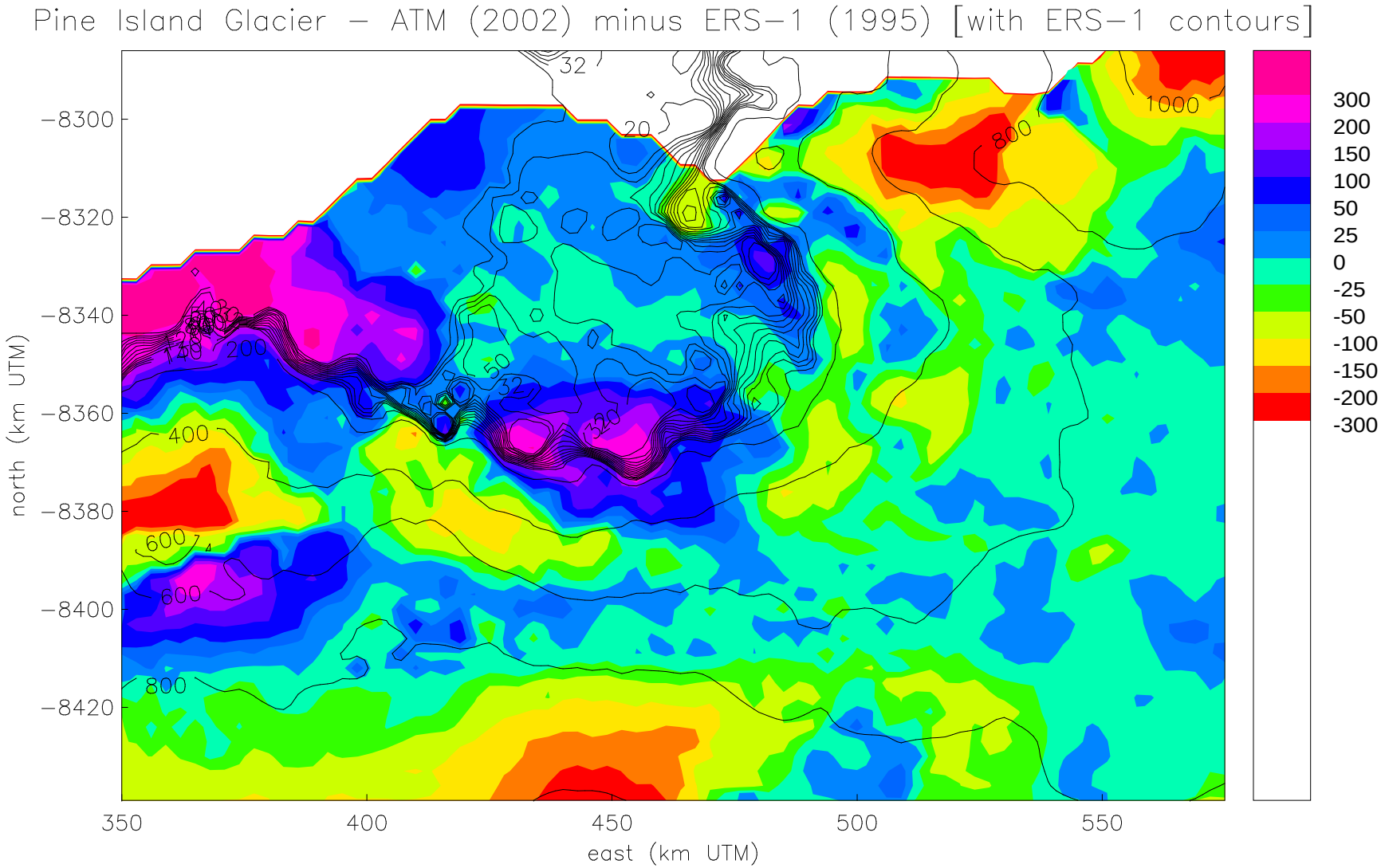
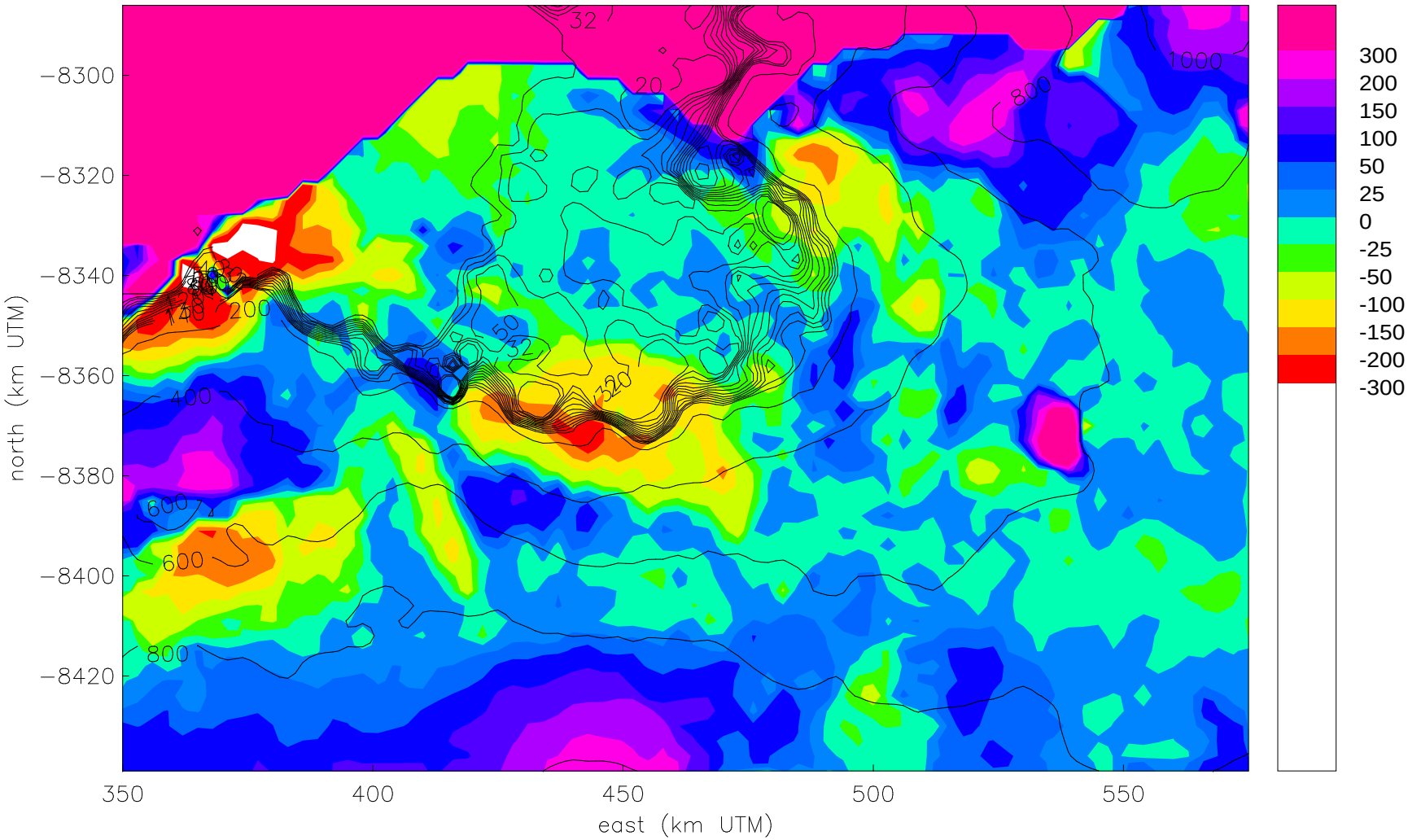
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
140
130
120
110
100
90
80
70
60
50
last33days.smallpine2.atlasstyle.contps 20050404 Laser L2A (Oct/Nov 2003)



scale 1:2000000 diff–atm20–ers1.wers1cont.smallpine2.col10.v2.totps 20050404

all–02–mid–icess–20.smallpine2.0.dtm minus m261e243–279n71–77.e.smallpine2.0.dt

Pine Island Glacier – GLAS (2003) minus ATM (2002) [with ERS–1 contours]



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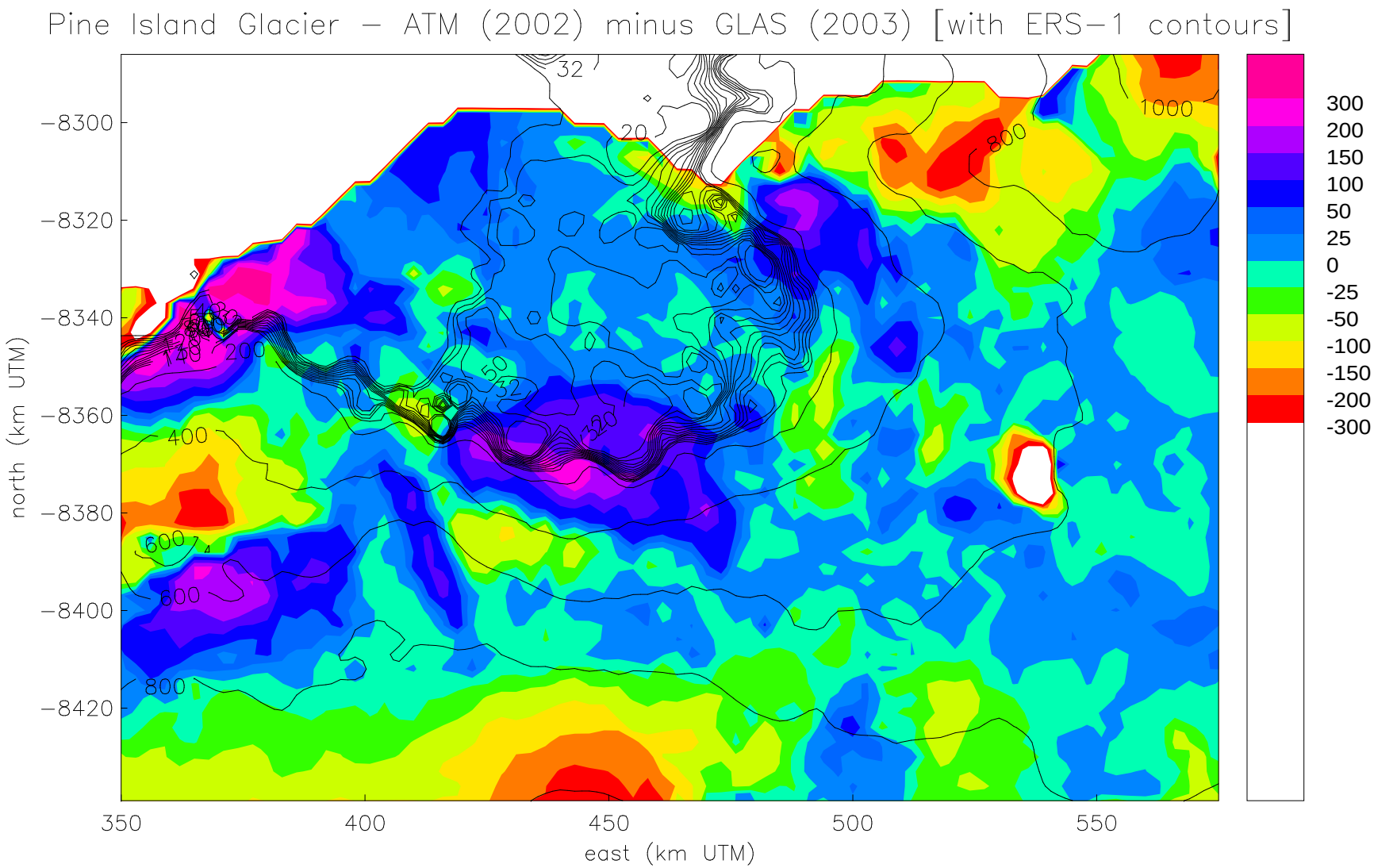
last33days.smallpine2.0.dtm minus all–02–mid–icess–20.smallpine2.0.dtm



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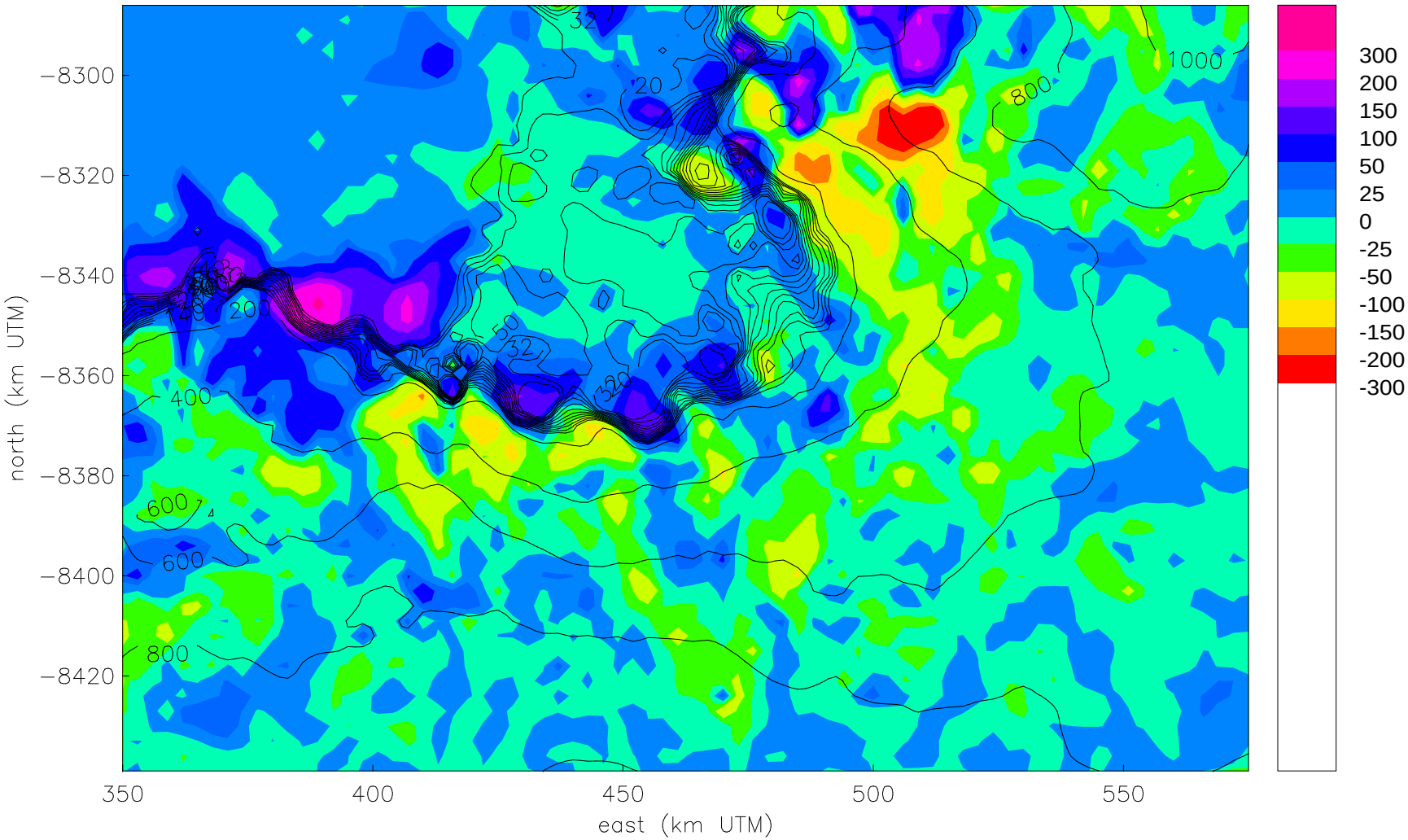
all–02–mid–icess–20.smallpine2.0.dtm minus last33days.smallpine2.0.dtm

Pine Island Glacier – GLAS (2003) minus ERS–1 (1995) [with ERS–1 contours]



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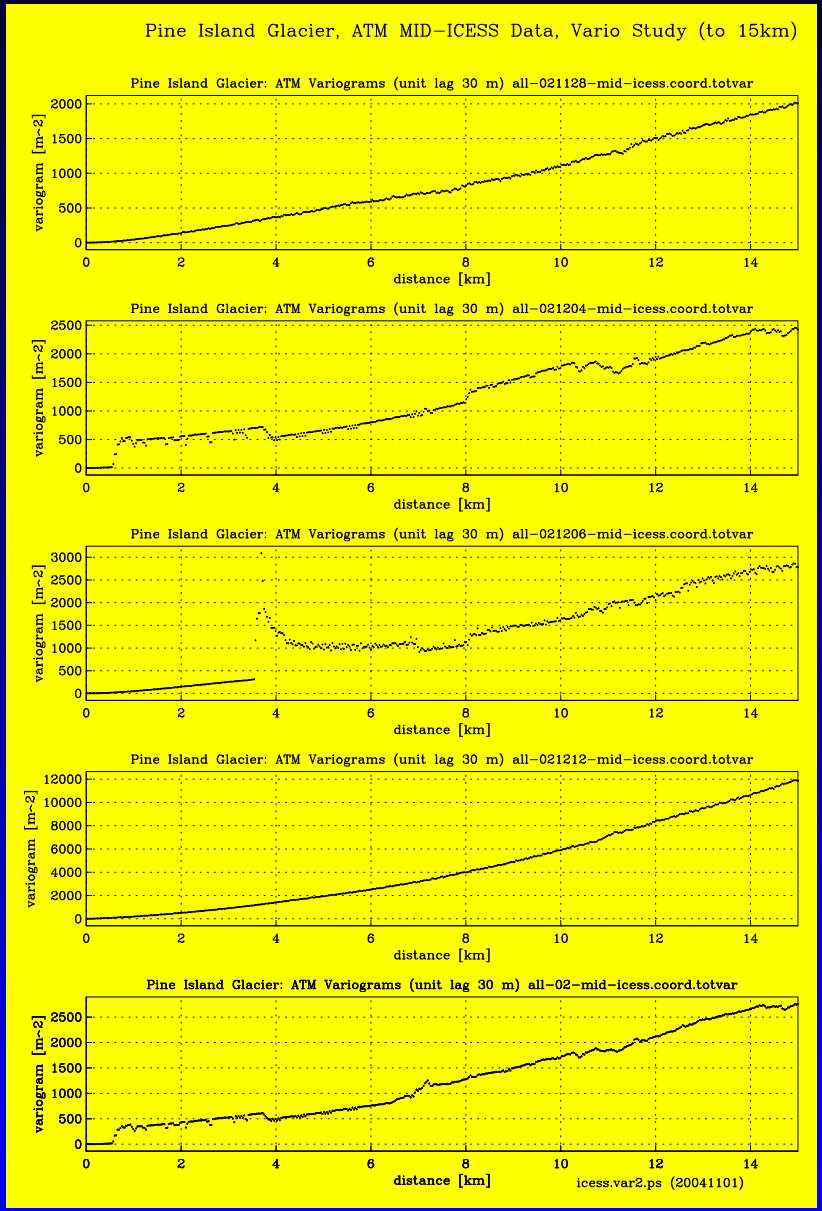
gla06.1.gain.smallpine2.0.dtm minus m261e243–279n71–77.e.smallpine2.0.dtm

.extra slides to follow@

ATM Data Variography