Cloud identification over snow/ice surfaces from ERBE to CERES: Improvements and implications

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Data Sets:

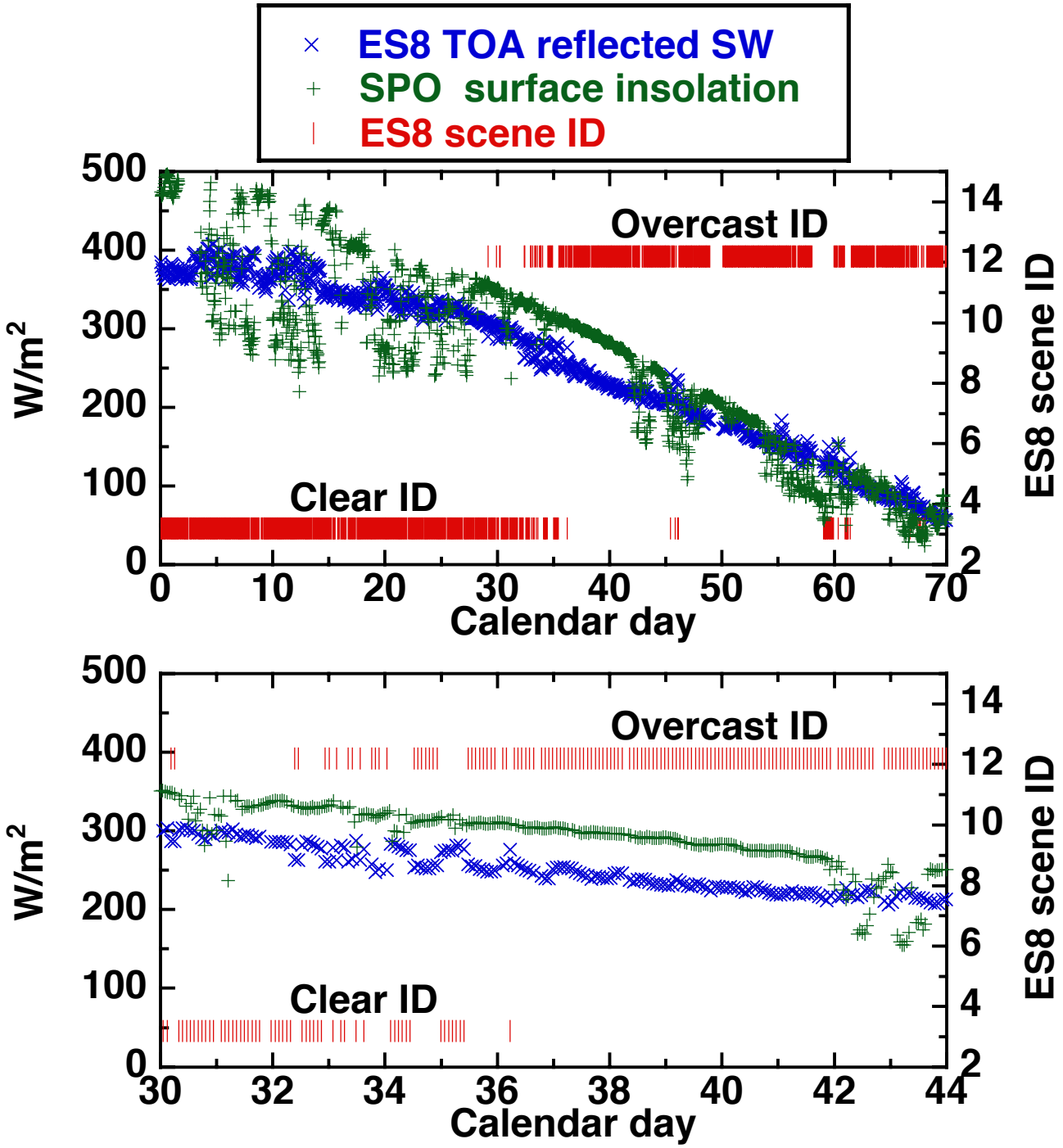
1. Hourly-mean surface insolation measurements made at the South Pole Observatory (SPO).

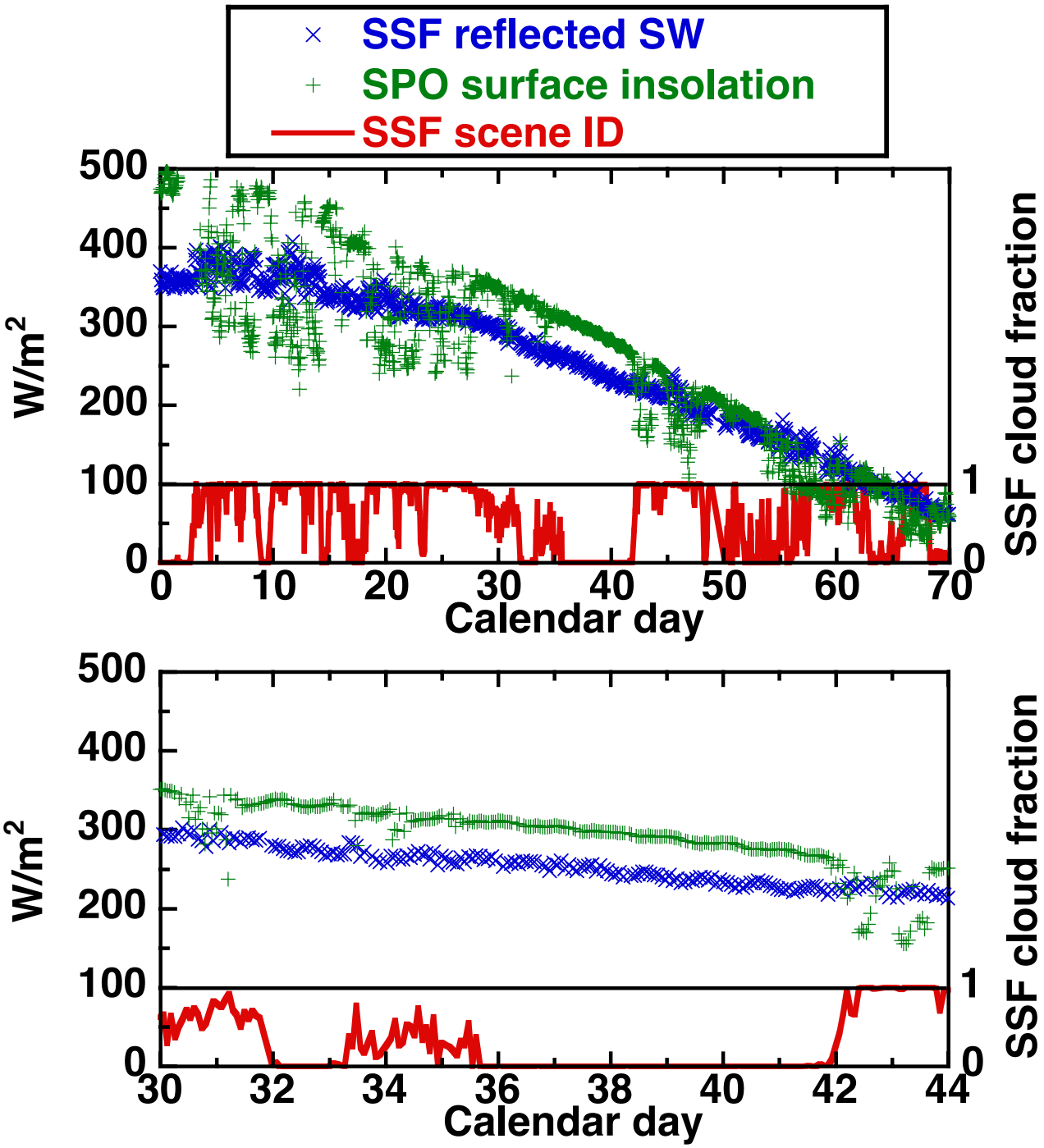
2. CERES ERBE-like (ES8) TOA reflected SW and OLR, and cloud identification (clear or overcast over snow/ice).

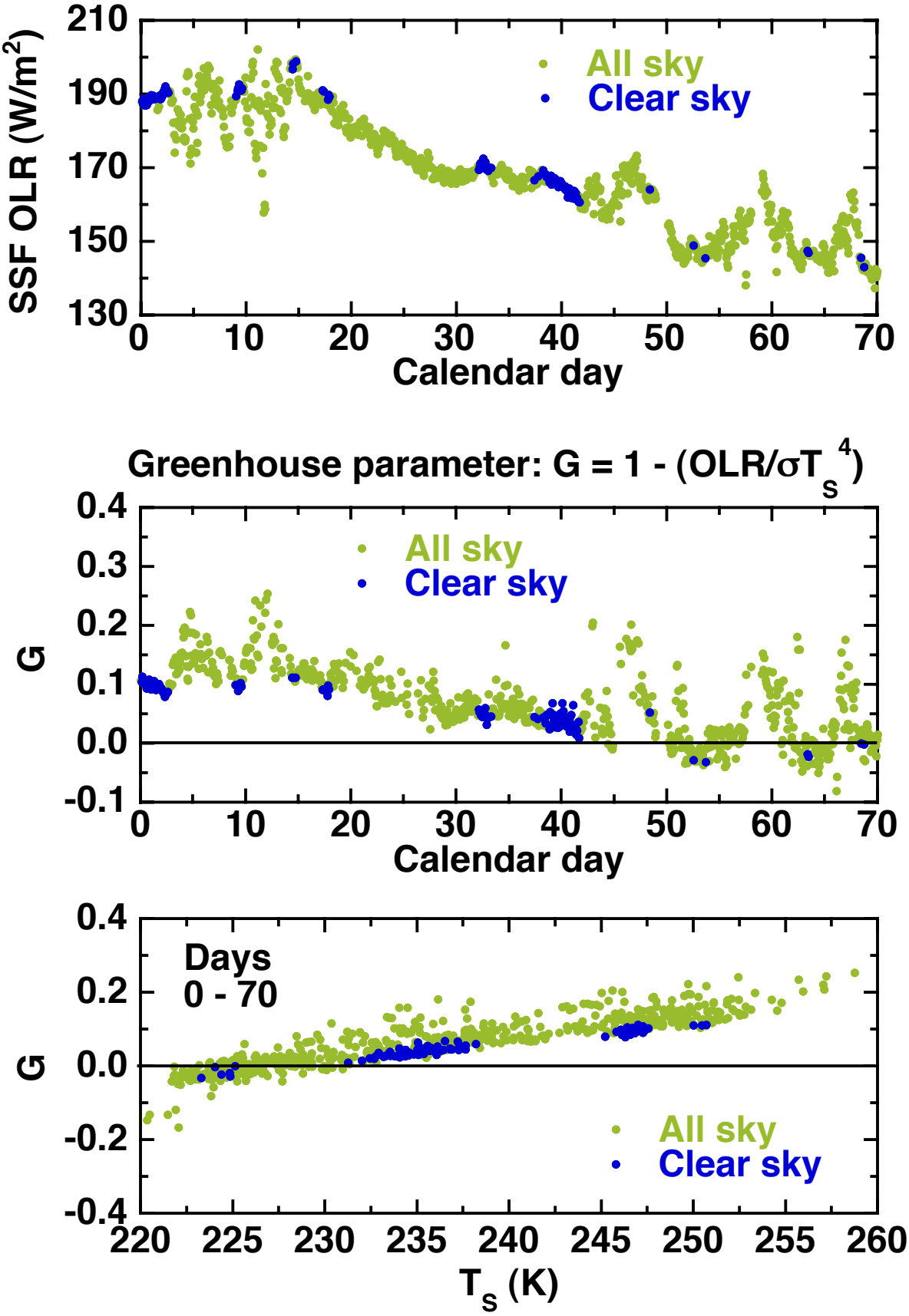
3. CERES SSF TOA reflected SW and OLR, and cloud identification (MODIS-derived cloud amount).

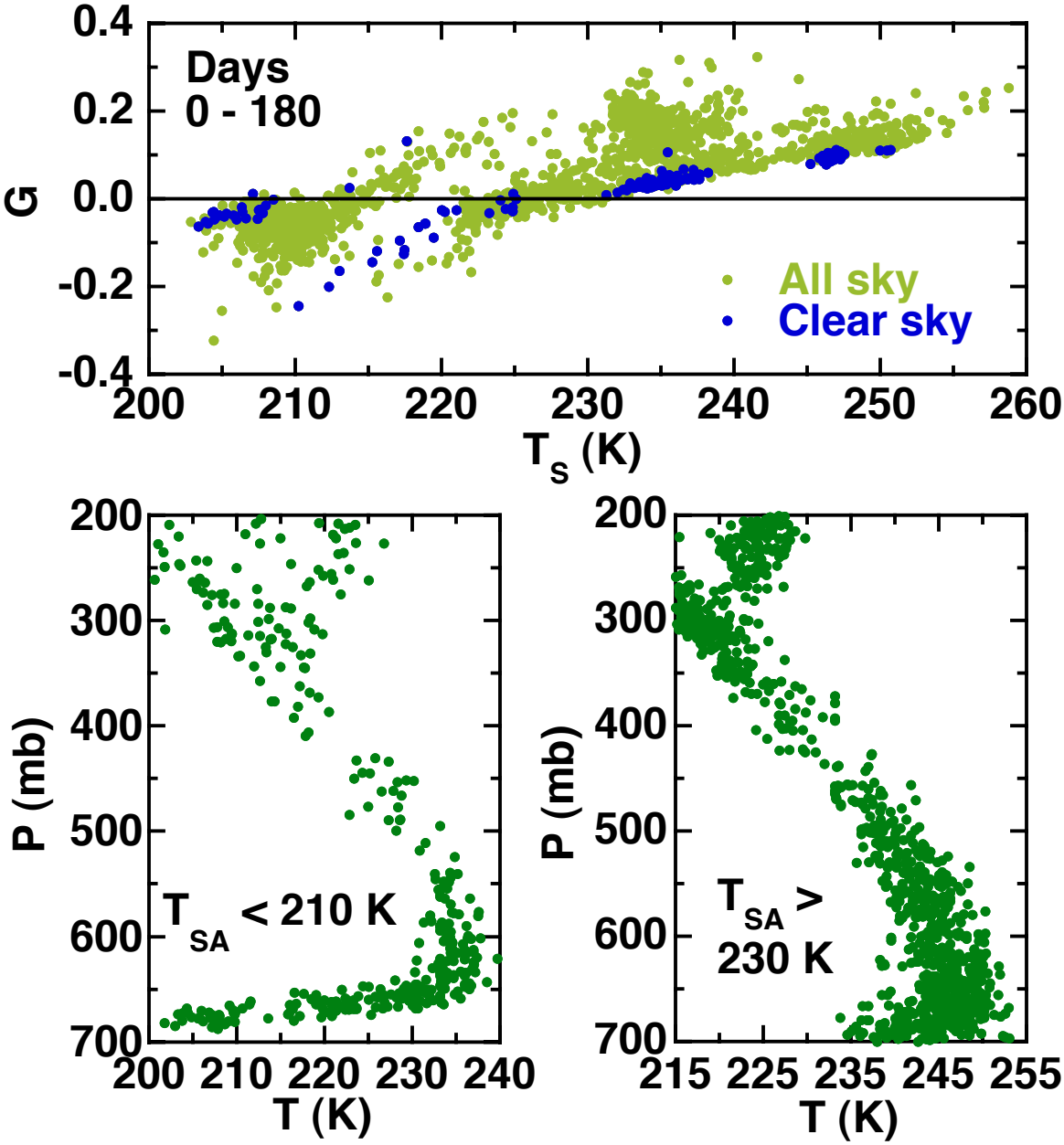
4. Modis-derived skin temperature.

The CERES data refer to measurements made from the Terra satellite for the first half-year of 2002.


ES8 TOA reflected SW
SPO surface insolation
ES8 scene ID
Overcast ID
Clear ID
W/m2
ES8 scene ID
Calendar day
0
10
20
30
40
50
60
70
100
200
300
400
500
2
4
6
8
10
12
14
32
34
36
38
42
44


SSF reflected SW
SPO surface insolation
SSF scene ID
W/m2
SSF cloud fraction
Calendar day
500
400
300
200
100
0
1
0
0
10
20
30
40
50
60
70
30
32
34
36
38
40
42
44


SSF OLR (W/m^2)
210
190
170
150
130
0
10
20
30
40
50
60
70
Calendar day
All sky
Clear sky
Greenhouse parameter: G = 1 - (OLR/σT$_s^4$)
G
0.4
0.3
0.2
0.1
0.0
-0.1
0
10
20
30
40
50
60
70
Calendar day
All sky
Clear sky
G
0.4
0.2
0.0
-0.2
-0.4
Days
0 - 70
All sky
Clear sky
220
225
230
235
240
245
250
255
260
T$_s$ (K)


Days
0 - 180
All sky
Clear sky
G
T_S (K)
T_{SA} < 210 K
T_{SA} > 230 K
P (mb)
T (K)

Conclusions

This study clearly illustrates the improvement in the CERES SSF cloud identification, over snow/ice surfaces, relative to the MLE cloud identification that was employed in ERBE. And one would expect a positive greenhouse effect in the absence of a temperature inversion, but a negative greenhouse effect in the presence of an inversion, and this study is consistent with that expectation, which provides credence to the CERES SSF cloud identification during the polar night.