Spectral Fluxes and BRDF from CERES ARM Radiation Experiment (CARE): Estimate Effects of Atmospheric Correction

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CERES SCIENCE TEAM MEETING
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HAMPTON, VA

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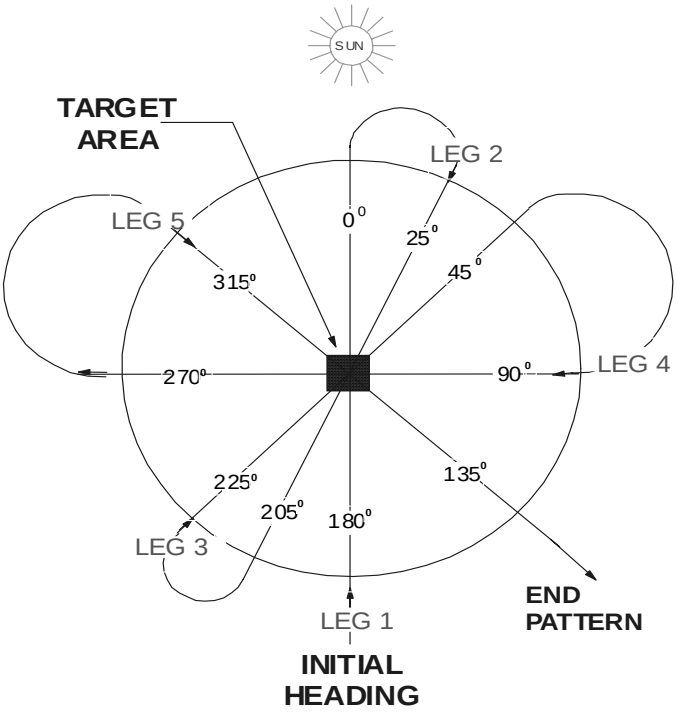
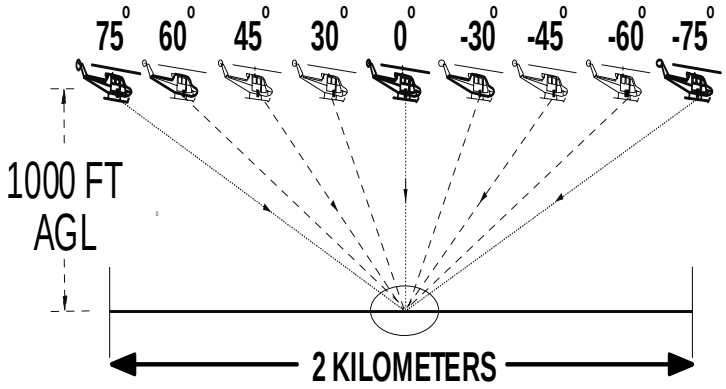
Table 1 BRDF Measurements taken during CARE

SZA/ Scene	25°	35°	40°	45°	50°	65°	70°	75°
Grass	229	219	219	219	219	219	219	219
Milo	229	X	228	227	227	226	226	226
Soybean	229	X	229	228	228	227	227	227
Wheat	229	X	227	218	226	218	218	218
Alfalfa	X	X	X	229	229	X	X	X

CERES ARS BRDF FLIGHT PATTERN

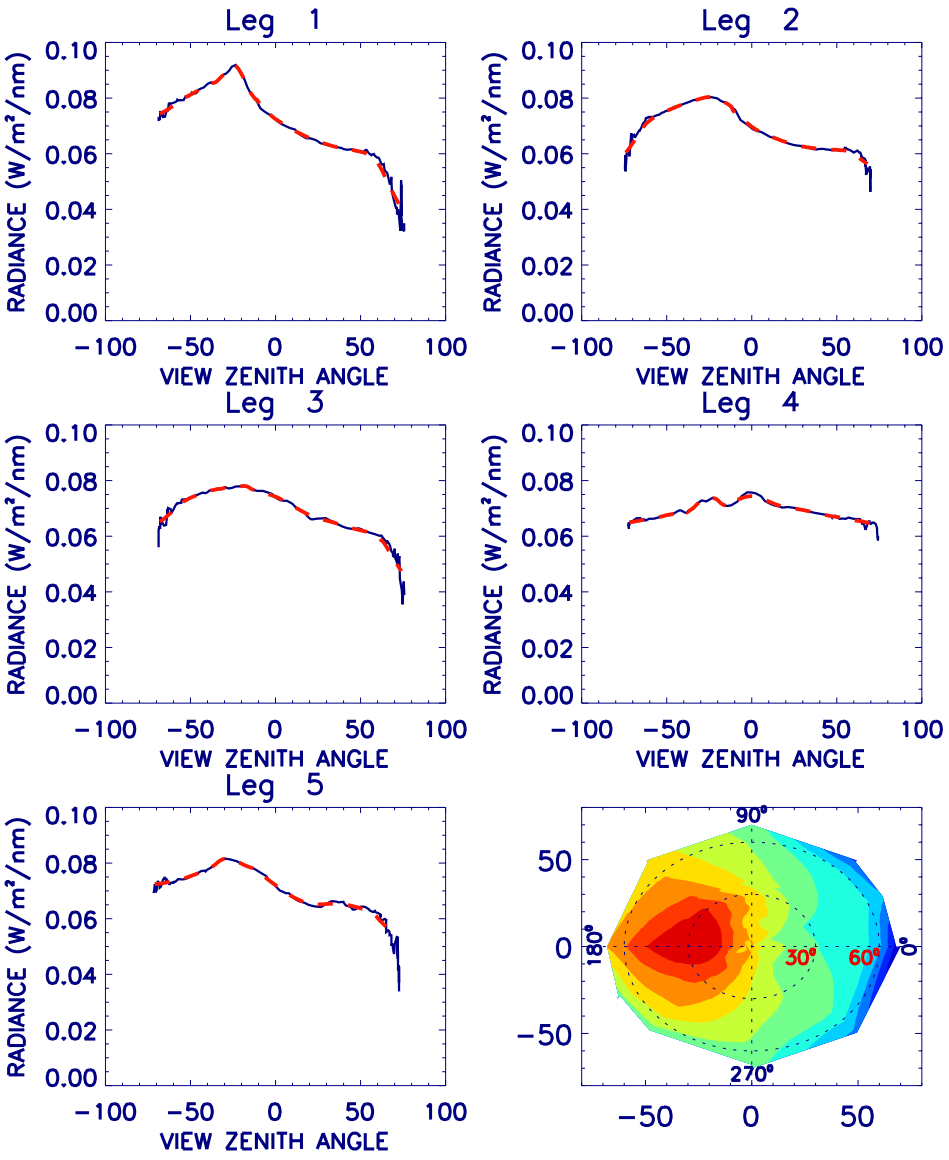


a) Horizontal



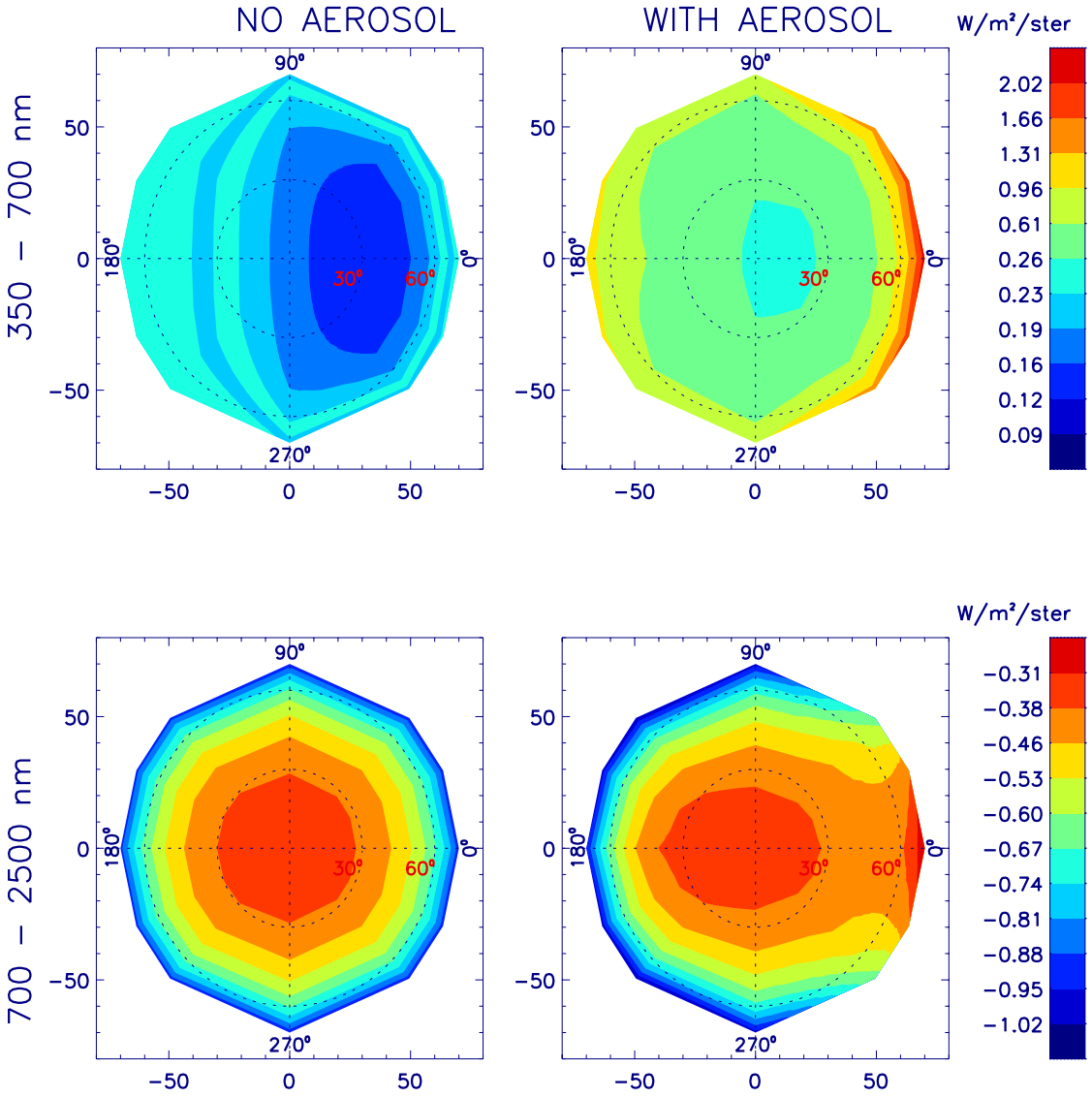
b) Vertical leg profiles.

WAVE LENGTH = 665 nm



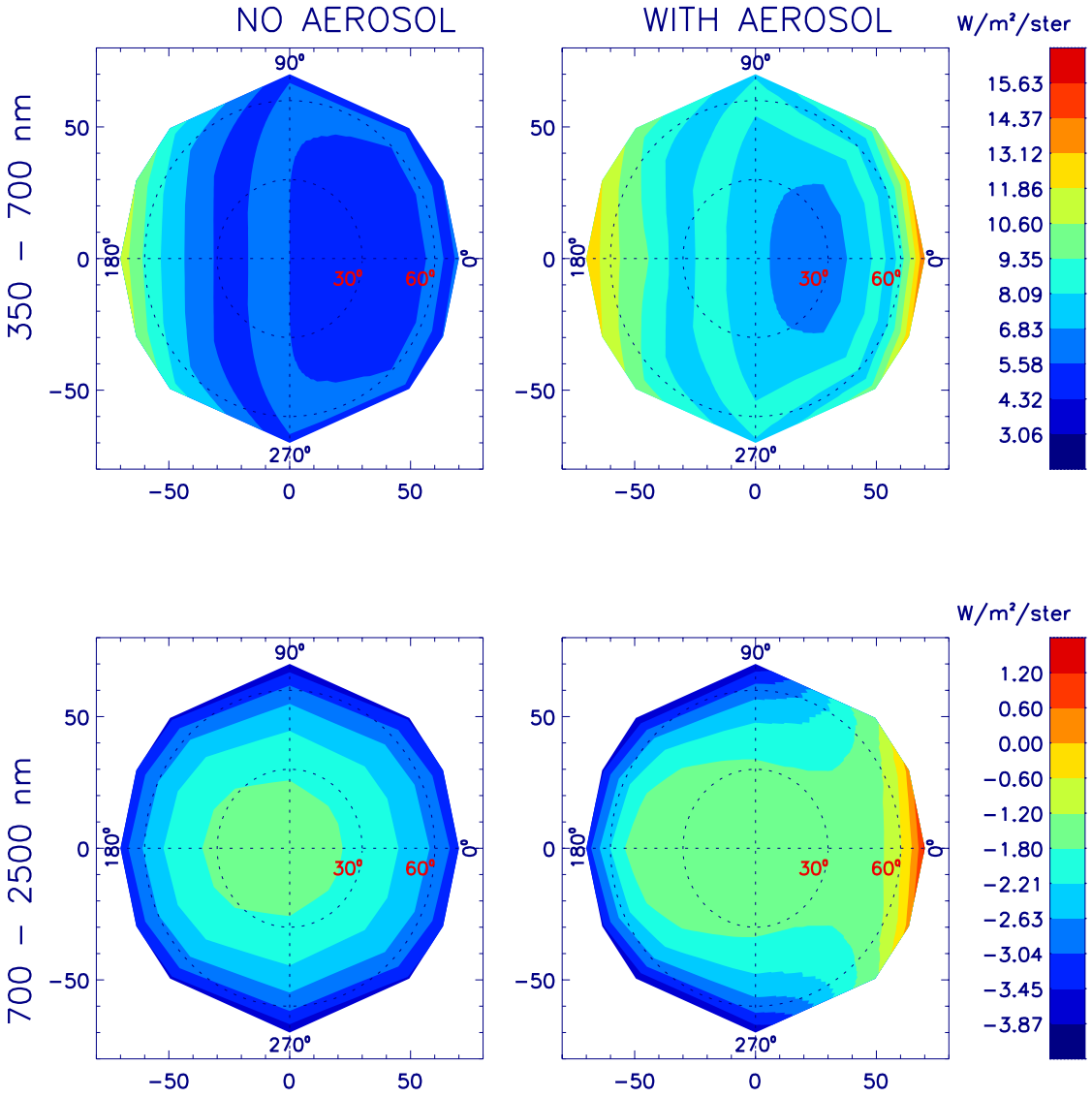
SCENE: WHEAT SZA=25

ATMOSPHERIC CORRECTION (300m−SURFACE)

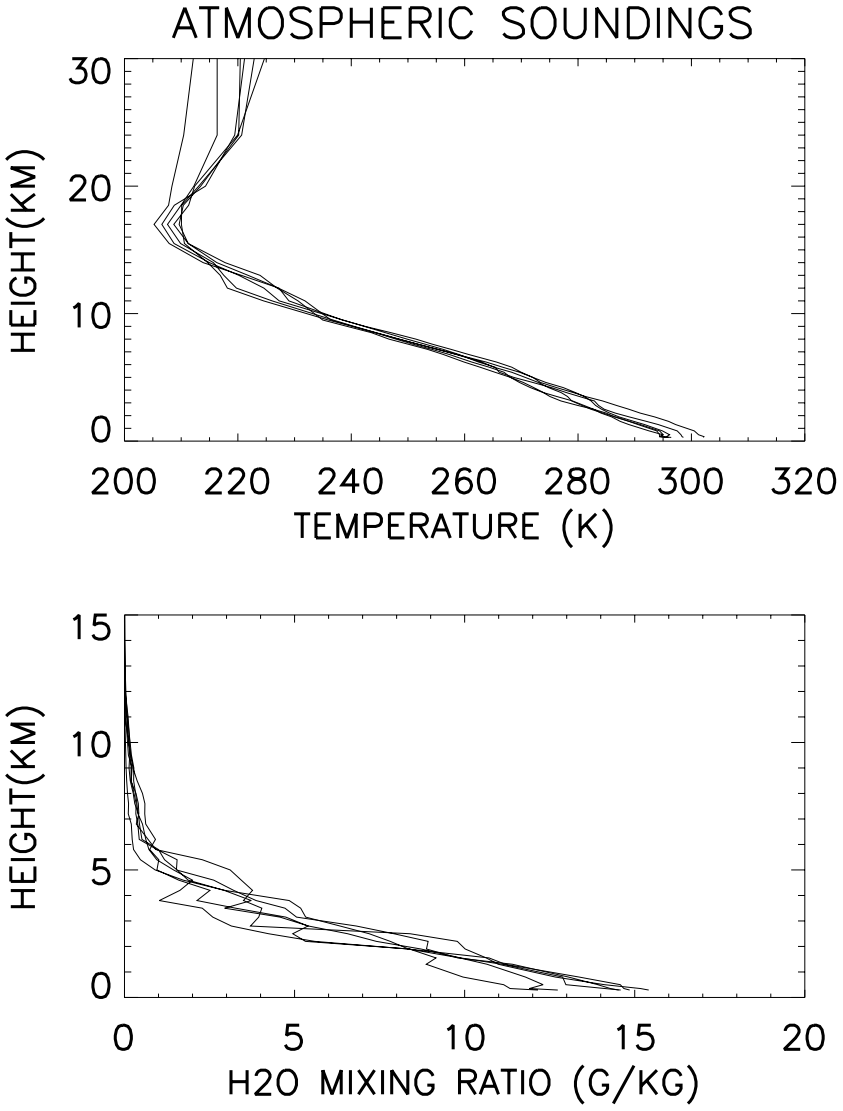


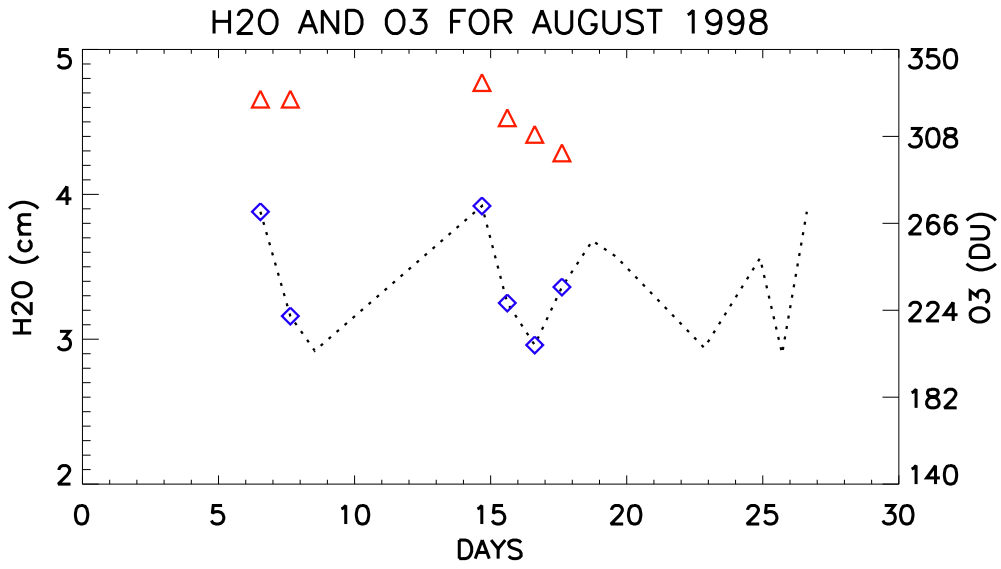
SZA = 45 ALBEDO = 0.3

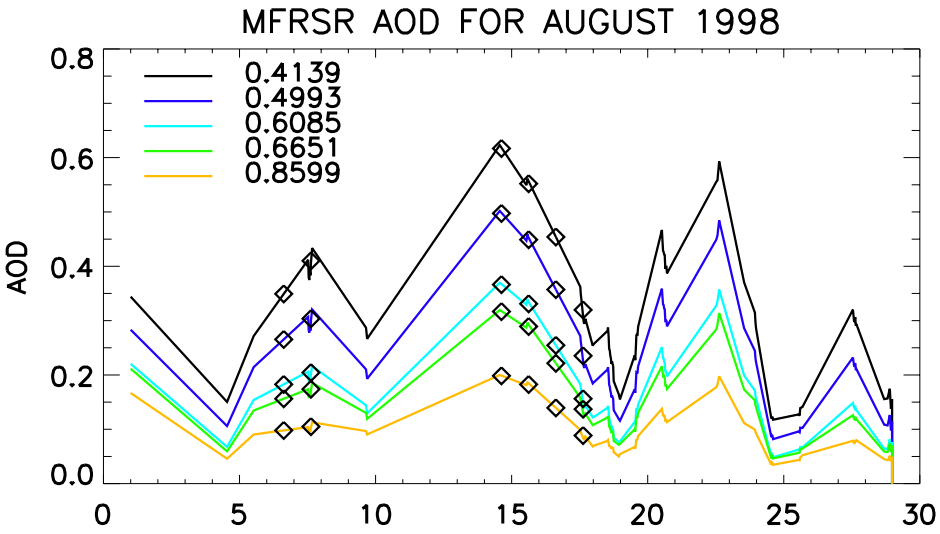
ATMOSPHERIC CORRECTION (TOA – SURFACE)



SZA = 45 ALBEDO = 0.3


ATMOSPHERIC SOUNDINGS
HEIGHT(KM)
30
20
10
0
200
220
240
260
280
300
320
TEMPERATURE (K)
HEIGHT(KM)
15
10
5
0
0
5
10
15
20
H2O MIXING RATIO (G/KG)

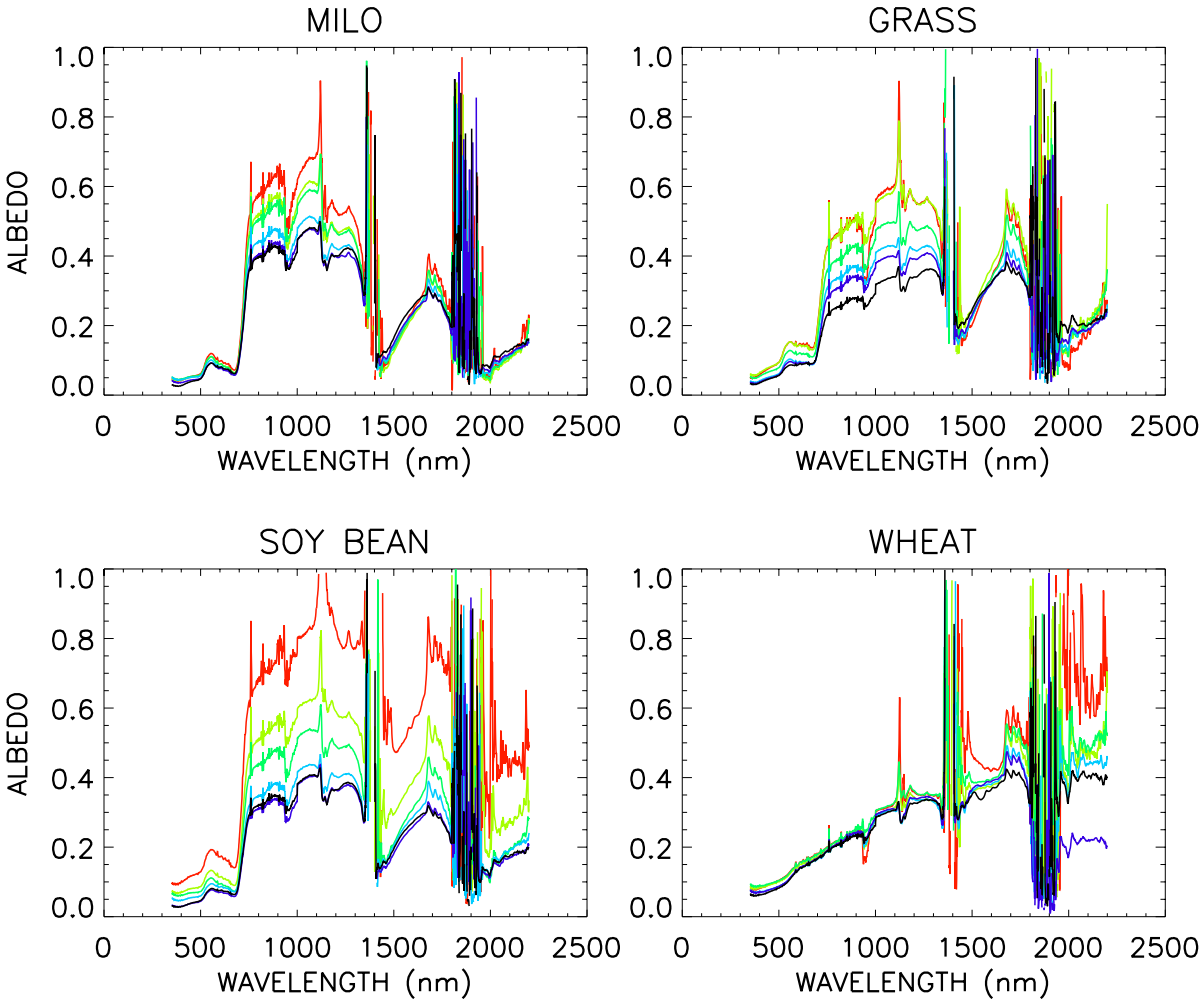

H2O AND O3 FOR AUGUST 1998
H2O (cm)
O3 (DU)
DAYS
5
4
3
2
350
308
266
224
182
140
0
5
10
15
20
25
30

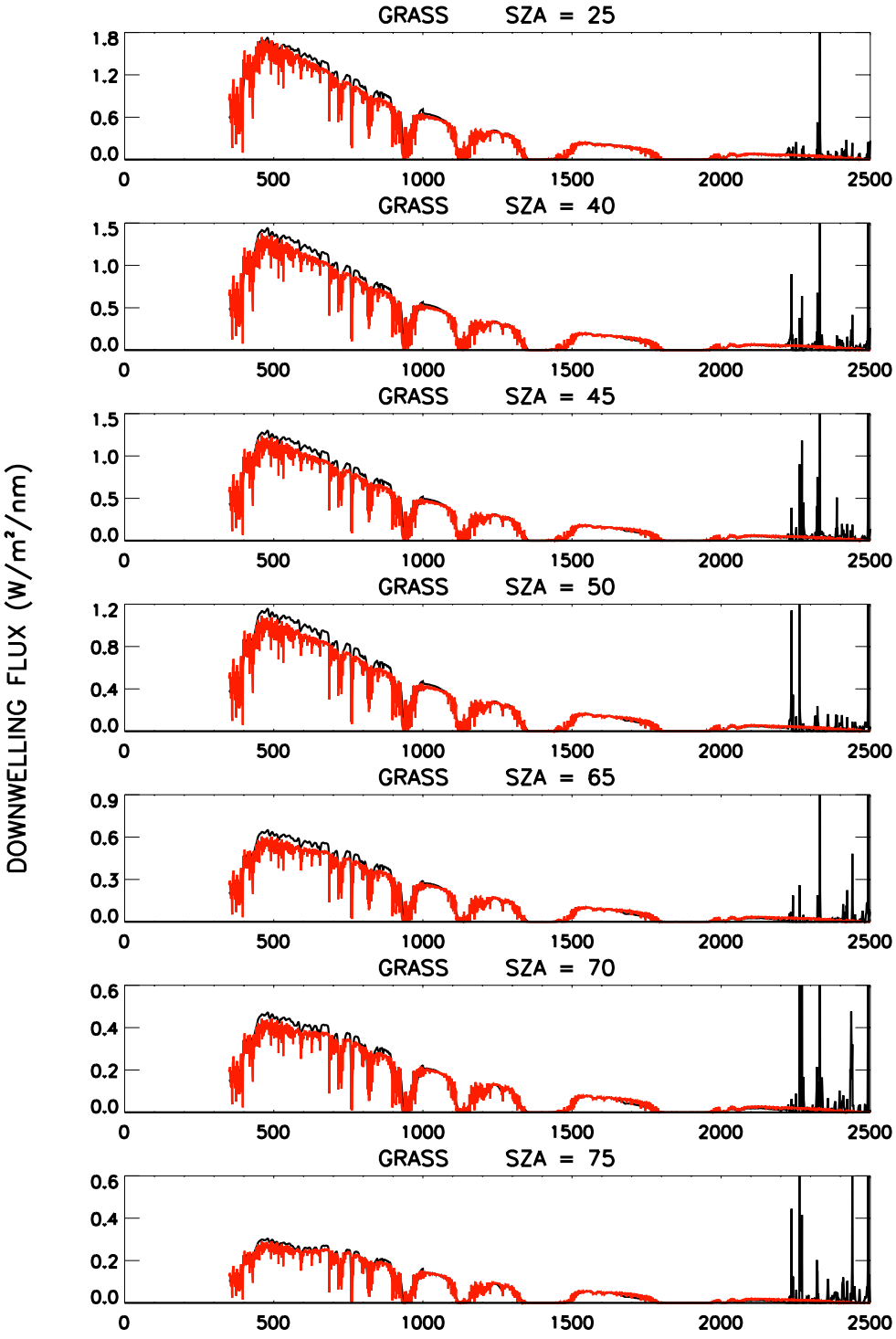

MFRSR AOD FOR AUGUST 1998
AOD
0.4139
0.4993
0.6085
0.6651
0.8599
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
30

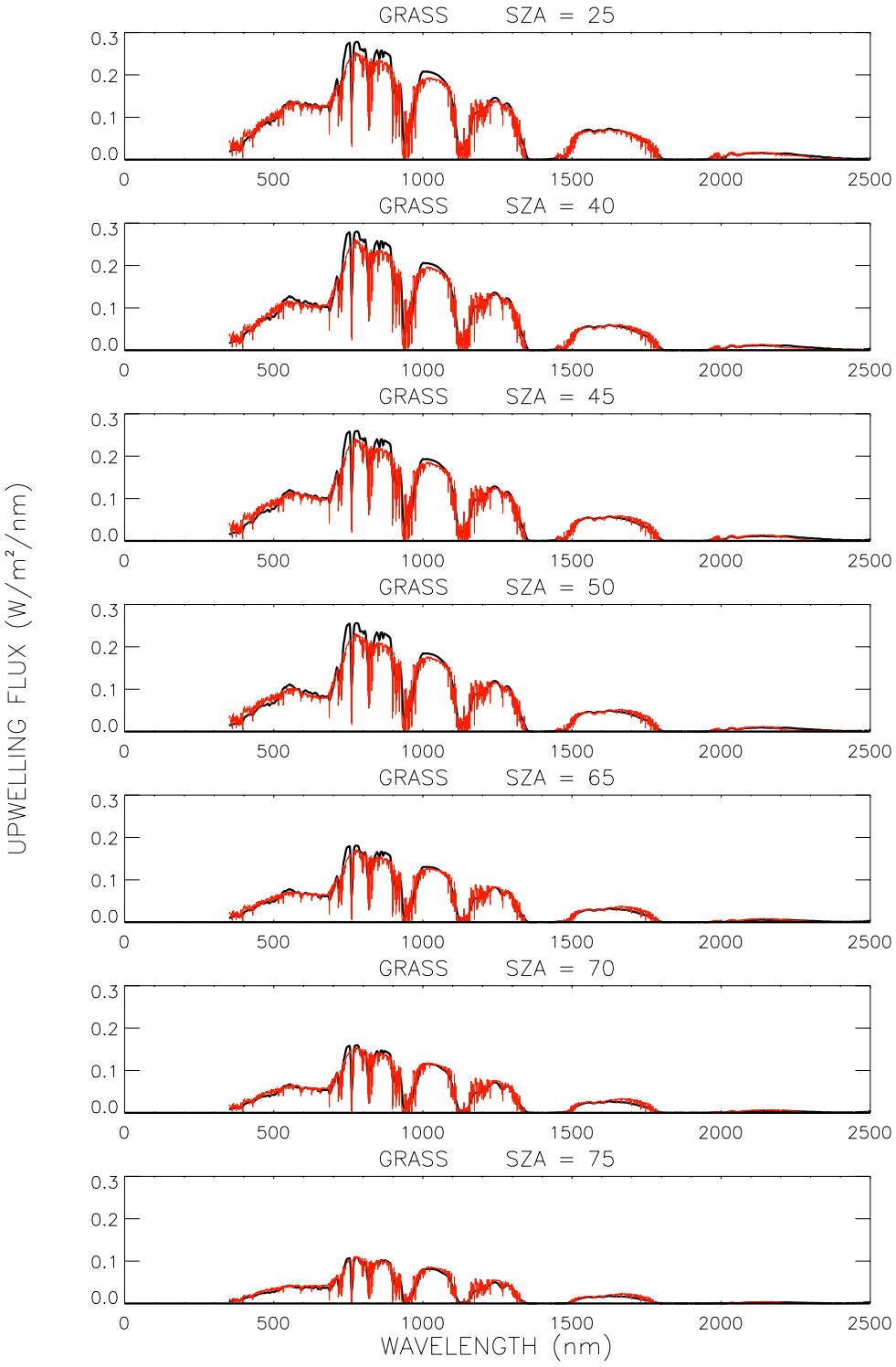
CERES ARM Radiation Experiment (CARE)

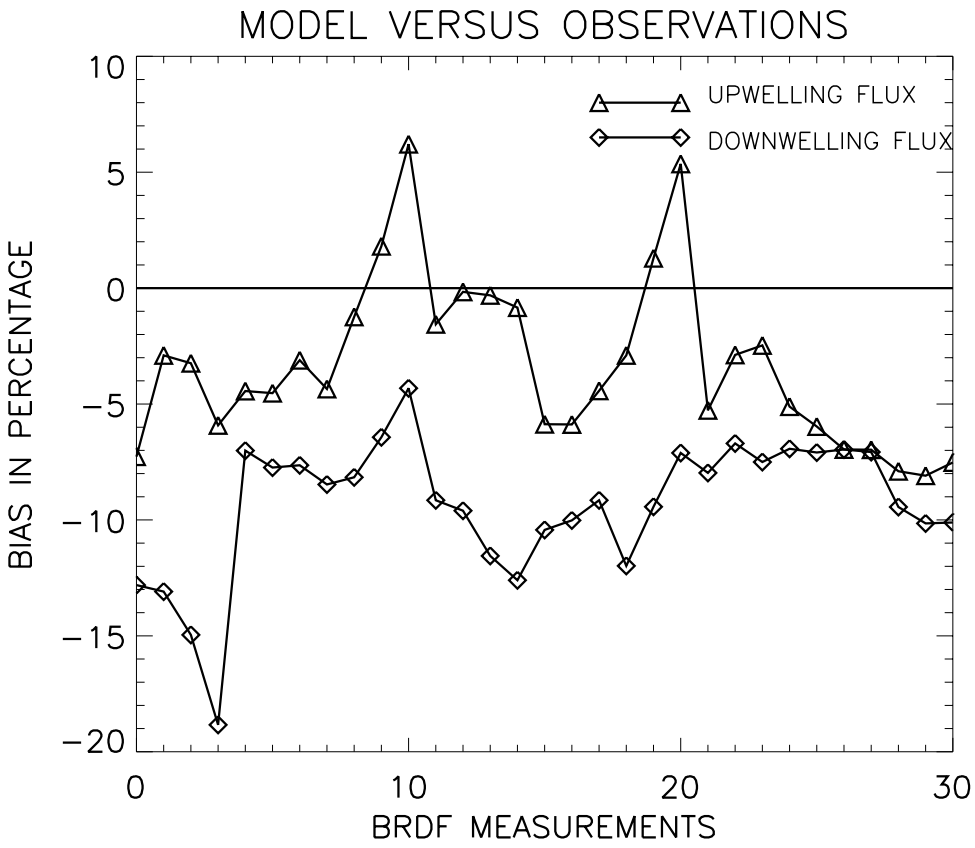
Oklahoma August 98

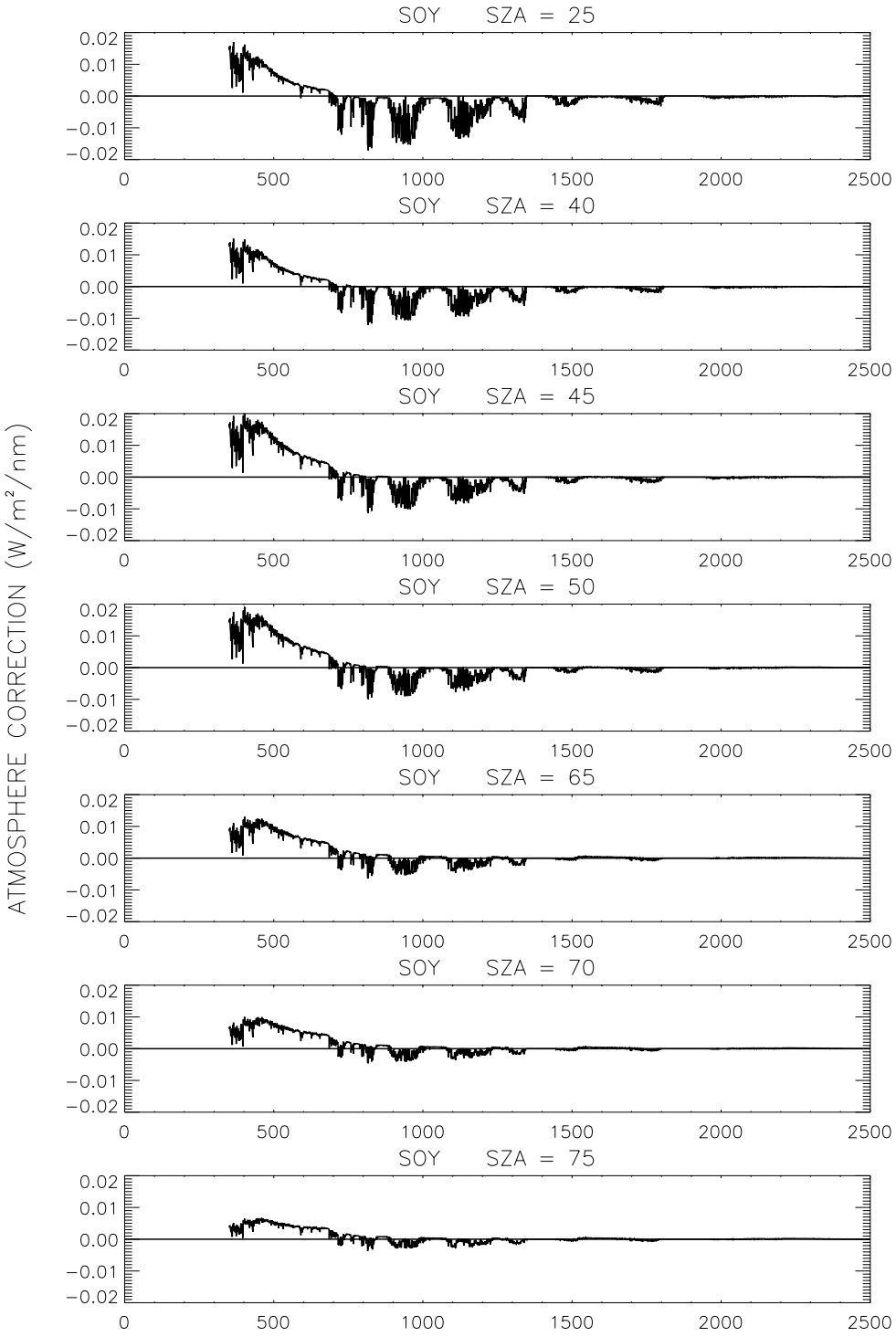
SURFACE SPECTRAL ALBEDO

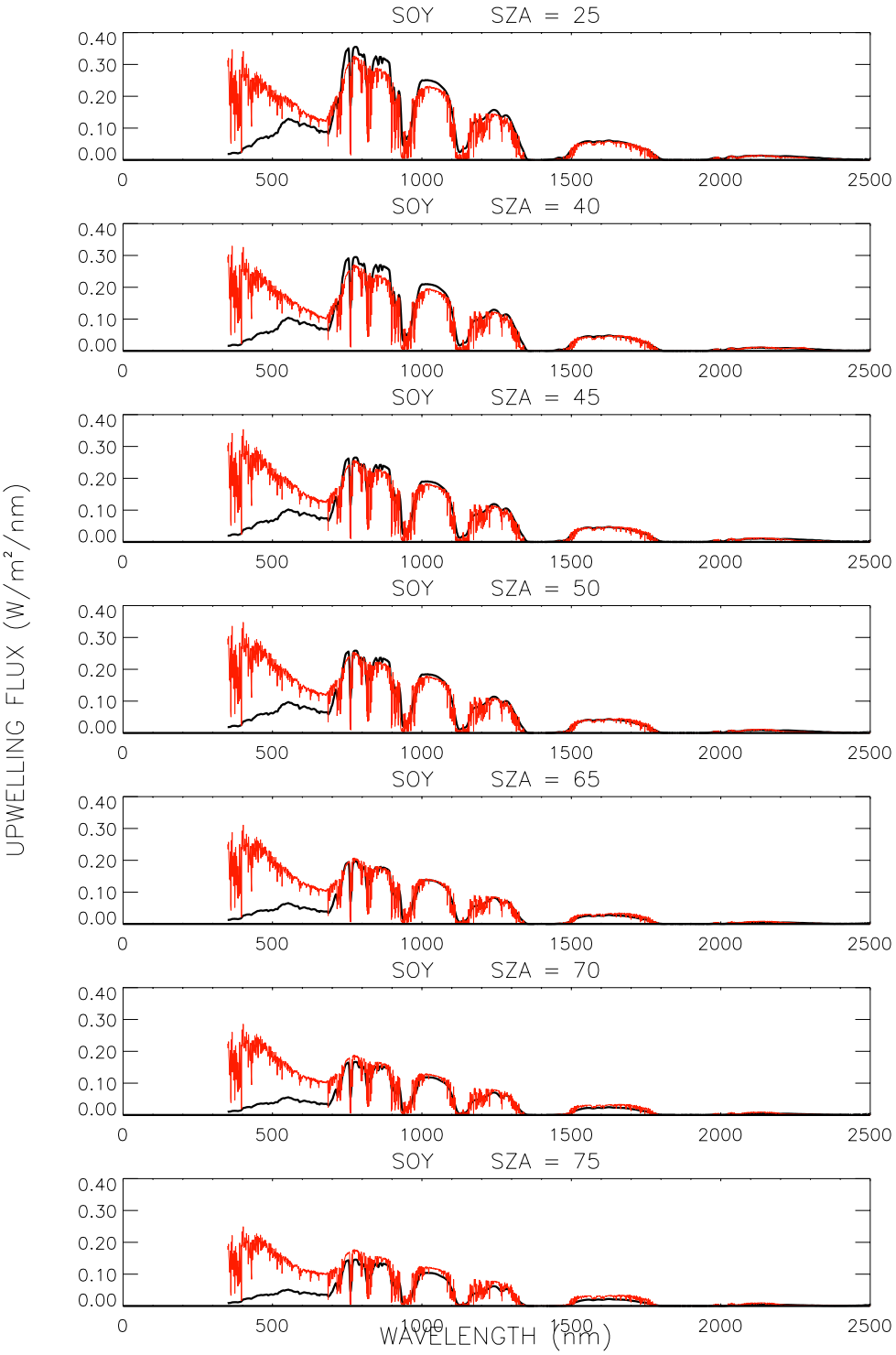



GRASS SZA = 25
GRASS SZA = 40
GRASS SZA = 45
GRASS SZA = 50
GRASS SZA = 65
GRASS SZA = 70
GRASS SZA = 75
DOWNWELLING FLUX (W/m²/nm)
0
500
1000
1500
2000
2500


GRASS SZA = 25
GRASS SZA = 40
GRASS SZA = 45
GRASS SZA = 50
GRASS SZA = 65
GRASS SZA = 70
GRASS SZA = 75
0.0
0.1
0.2
0.3
0
500
1000
1500
2000
2500
UPWELLING FLUX (W/m²/nm)
WAVELENGTH (nm)


MODEL VERSUS OBSERVATIONS
UPWELLING FLUX
DOWNWELLING FLUX
BIAS IN PERCENTAGE
BRDF MEASUREMENTS
10
5
0
−5
−10
−15
−20
0
10
20
30

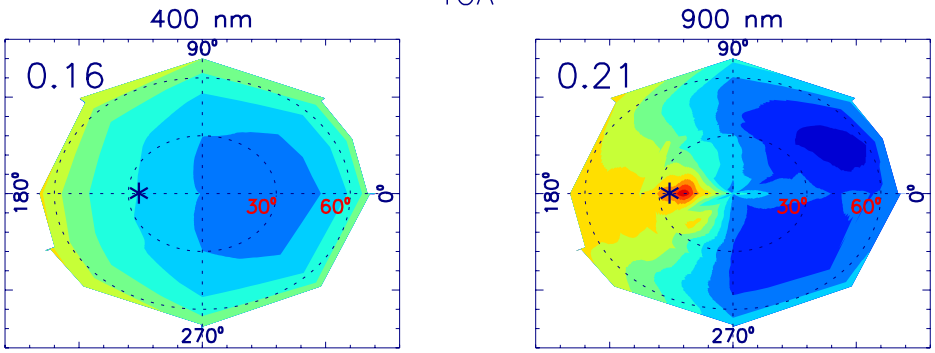

SOY SZA = 25
SOY SZA = 40
SOY SZA = 45
SOY SZA = 50
SOY SZA = 65
SOY SZA = 70
SOY SZA = 75
ATMOSPHERE CORRECTION (W/m²/nm)
0.02
0.01
0.00
−0.01
−0.02
0
500
1000
1500
2000
2500


SOY SZA = 25
SOY SZA = 40
SOY SZA = 45
SOY SZA = 50
SOY SZA = 65
SOY SZA = 70
SOY SZA = 75
0.40
0.30
0.20
0.10
0.00
0
500
1000
1500
2000
2500
UPWELLING FLUX (W/m²/nm)
WAVELENGTH (nm)

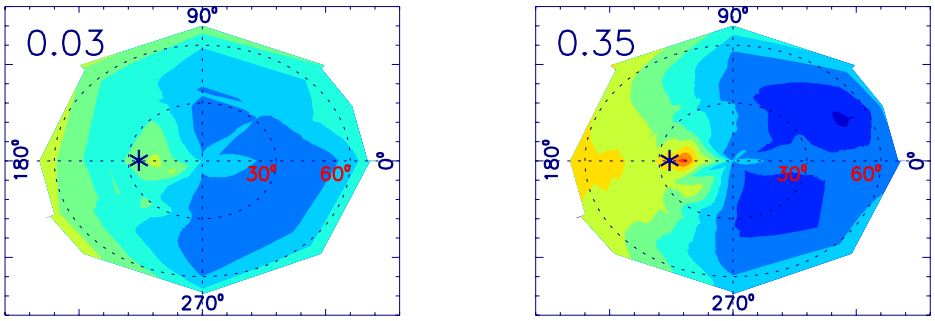
CERES ARM Radiation Experiment (CARE)

Oklahoma August 98 BRDF

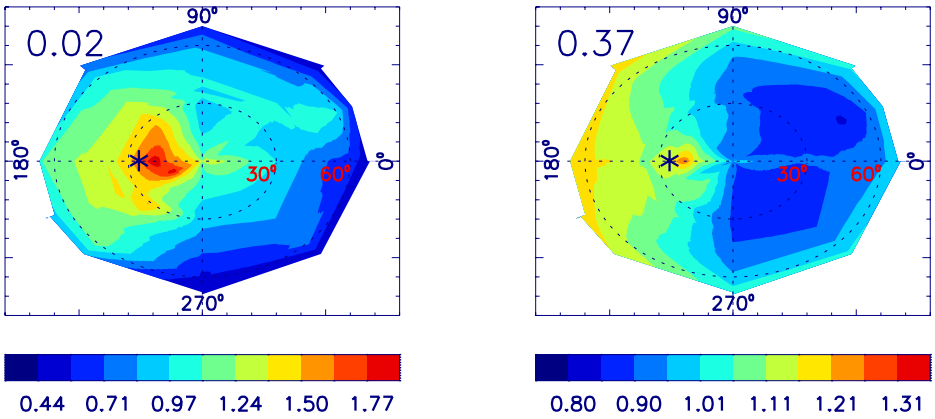
TOA



HELICOPTER (300m)



SURFACE



SCENE: SOY SZA = 25

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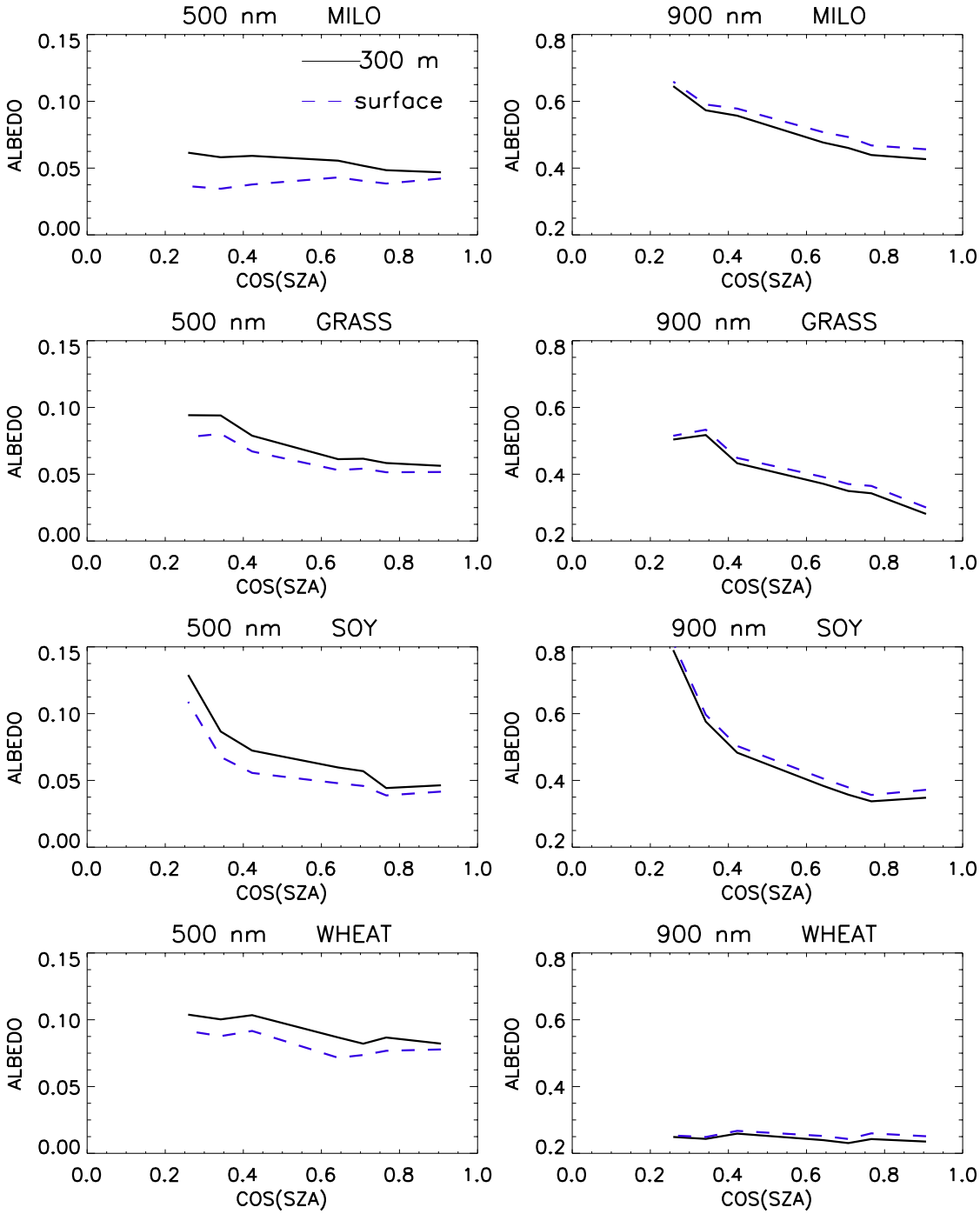
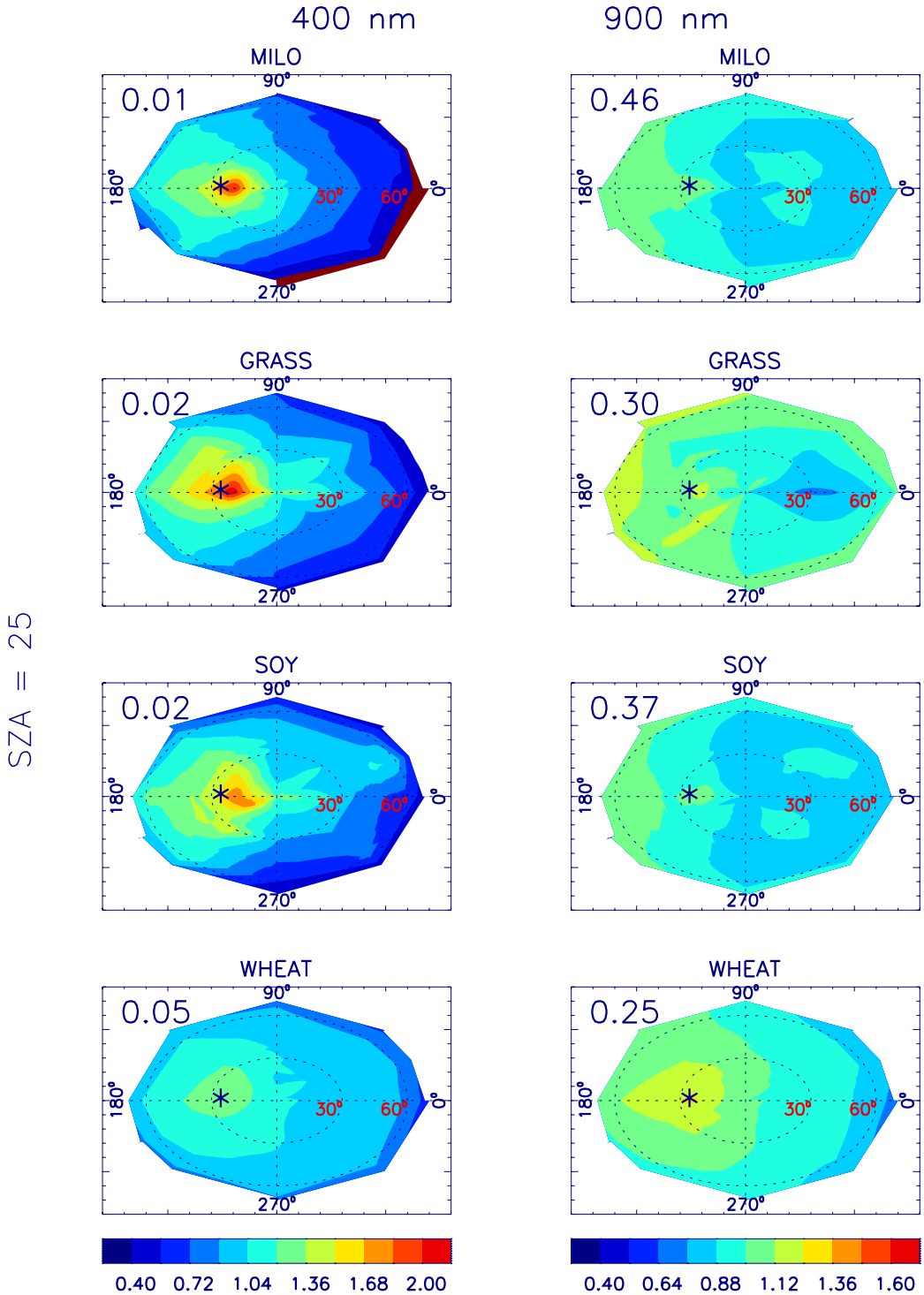
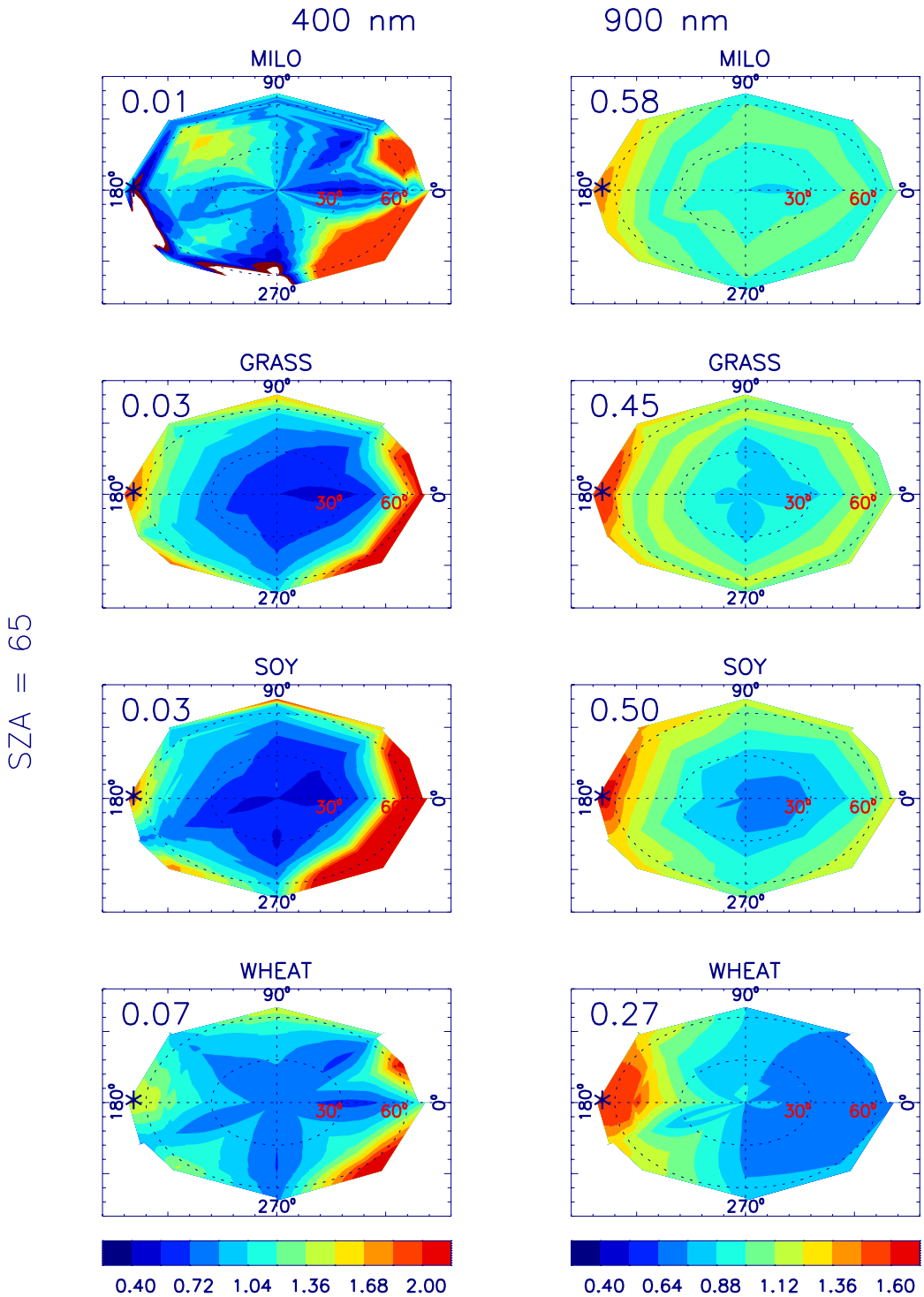
Oklahoma August 98



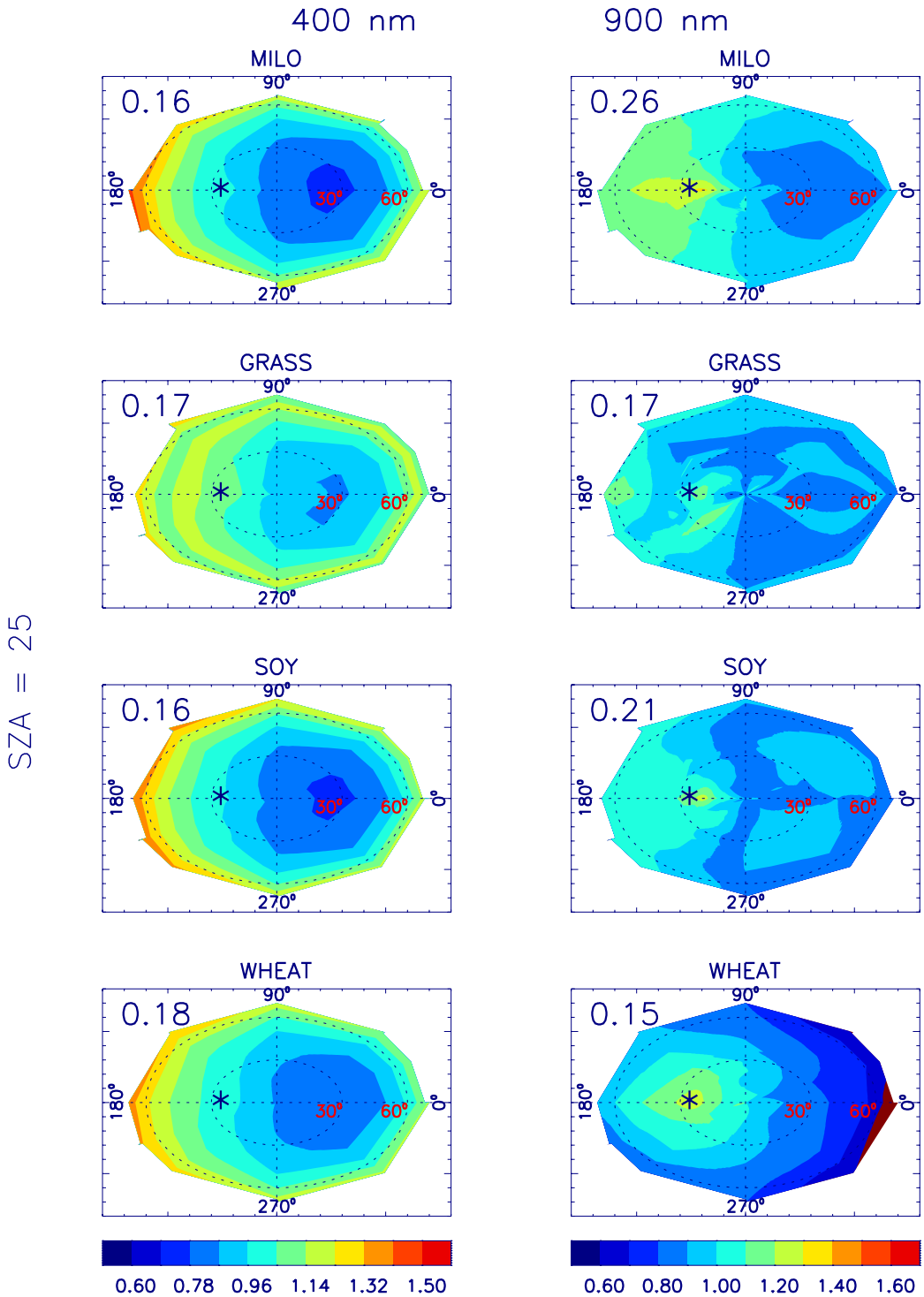
SURFACE BRDF (ASF)



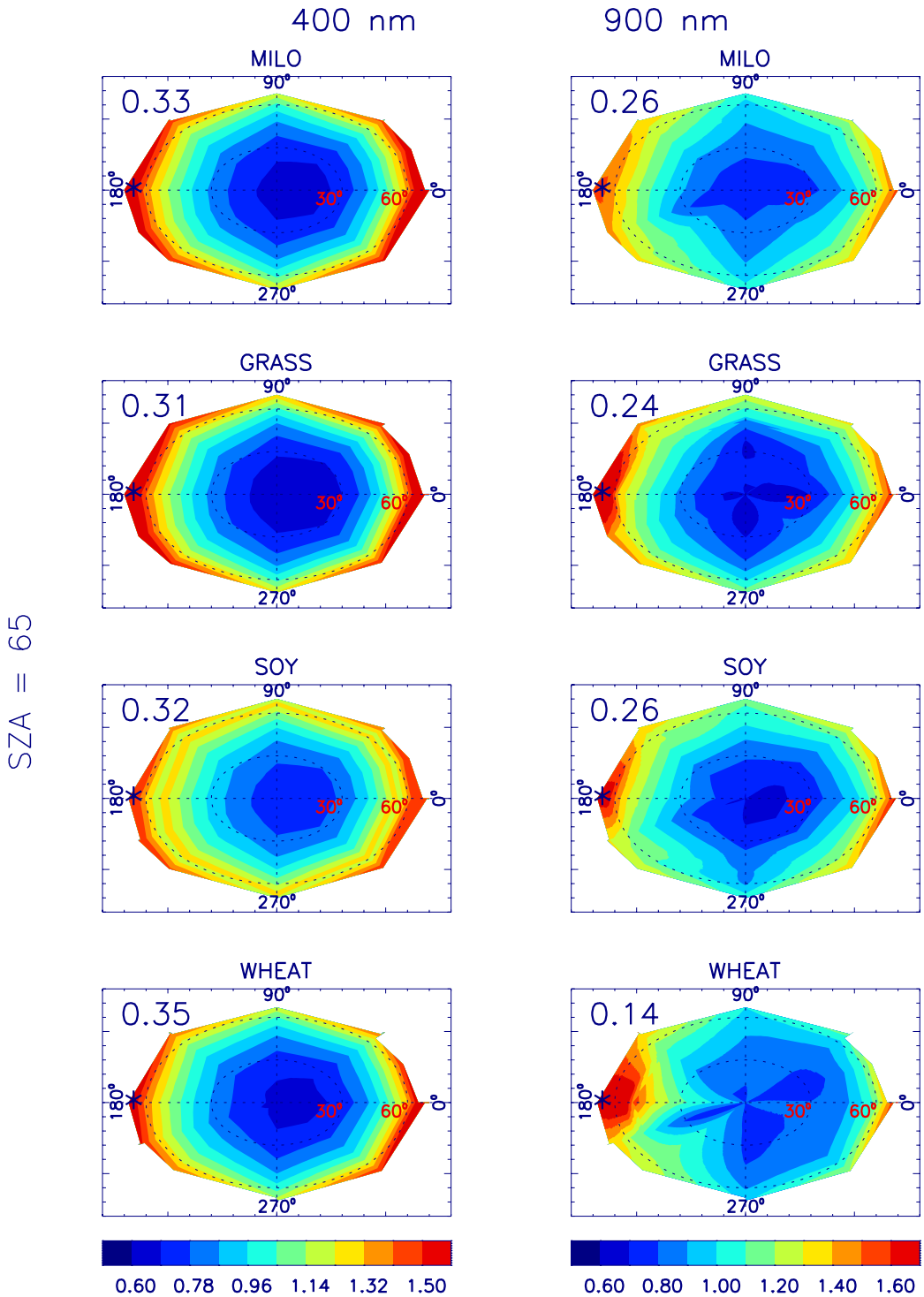
SURFACE BRDF (ASF)



TOA BRDF (ASF)


400 nm
900 nm
SZA = 25
MILO
0.16
MILO
0.26
GRASS
0.17
GRASS
0.17
SOY
0.16
SOY
0.21
WHEAT
0.18
WHEAT
0.15
90°
180°
0°
270°
30°
60°
0.60 0.78 0.96 1.14 1.32 1.50
0.60 0.80 1.00 1.20 1.40 1.60

TOA BRDF (ASF)


400 nm
900 nm
SZA = 65
MILO
0.33
MILO
0.26
GRASS
0.31
GRASS
0.24
SOY
0.32
SOY
0.26
WHEAT
0.35
WHEAT
0.14
90°
180°
0°
270°
30°
60°
0.60 0.78 0.96 1.14 1.32 1.50
0.60 0.80 1.00 1.20 1.40 1.60