Part III

Consistency Check of the mean radiance and irradiance

SSF ed. 1

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We define the angular distribution model of radiance such as

$$ADM(\mu, \phi, \mu_0) = \frac{\pi I(\mu, \phi, \mu_0)}{\int \mu I(\mu, \phi, \mu_0) d\Omega}.$$

To compute the irradiance, we apply the model

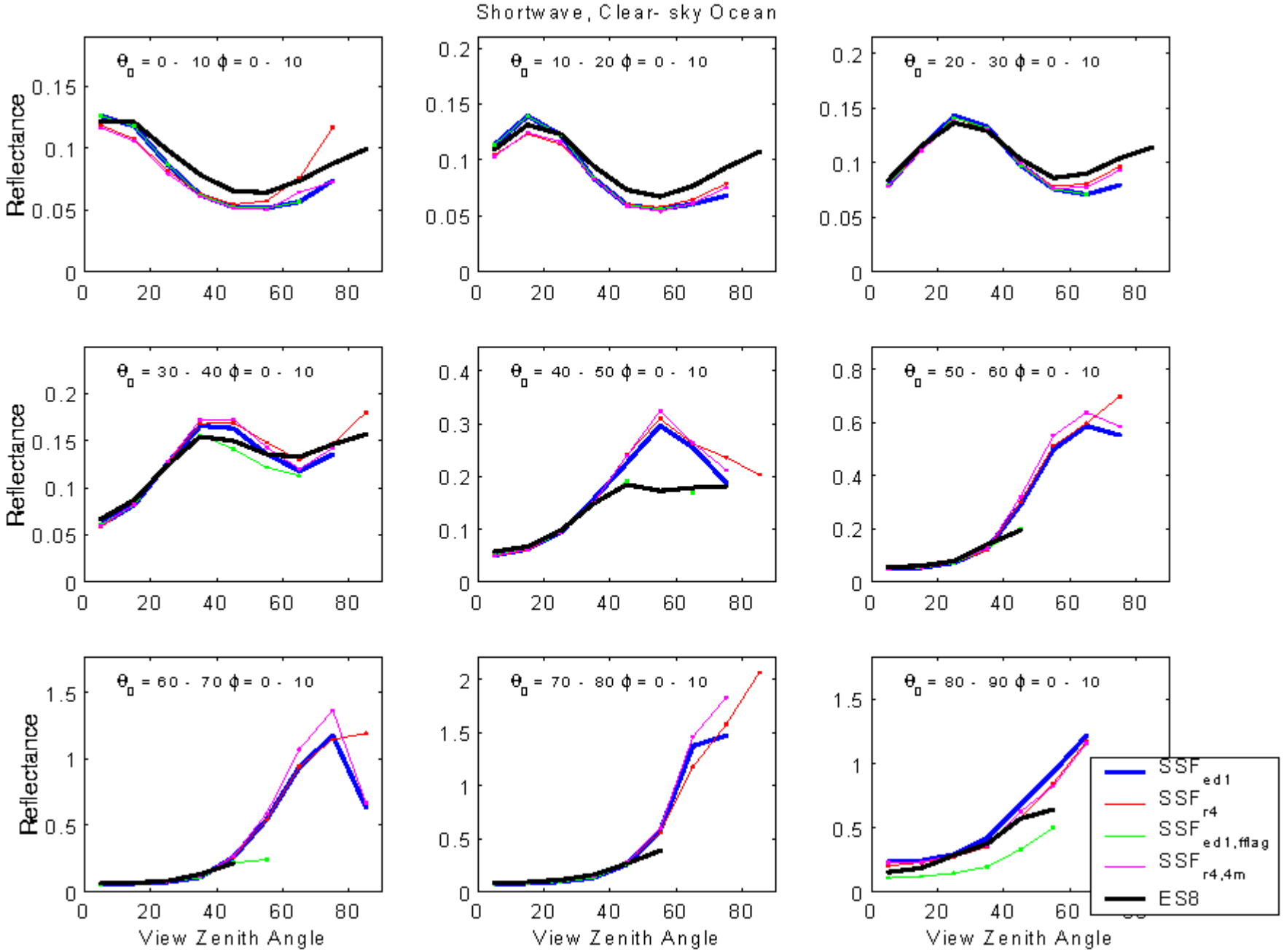
$$F(\mu, \phi, \mu_0) = \frac{\pi I'(\mu, \phi, \mu_0)}{ADM(\mu, \phi, \mu_0)} = \frac{I'(\mu, \phi, \mu_0)}{I(\mu, \phi, \mu_0)} \int \mu I(\mu, \phi, \mu_0) d\Omega$$

Therefore, the irradiance in edition 1 is

$$F_{ed1}(\mu, \phi, \mu_0) = \frac{\pi I_{ed1}(\mu, \phi, \mu_0)}{ADM_{r4}(\mu, \phi, \mu_0)} = \frac{I_{ed1}(\mu, \phi, \mu_0)}{I_{r4}(\mu, \phi, \mu_0)} \int \mu I_{r4}(\mu, \phi, \mu_0) d\Omega.$$

The irradiance in ES8 with edition 1 scene ID is

$$\begin{aligned} F_{es8,ssf}(\mu, \phi, \mu_0) &= \frac{\pi I_{ed1}(\mu, \phi, \mu_0)}{ADM_{es8}(\mu, \phi, \mu_0)} \\ &= \frac{I_{ed1}(\mu, \phi, \mu_0)}{I_{es8}(\mu, \phi, \mu_0)} \int \mu I_{es8}(\mu, \phi, \mu_0) d\Omega. \end{aligned}$$


Shortwave, Clear- sky Ocean
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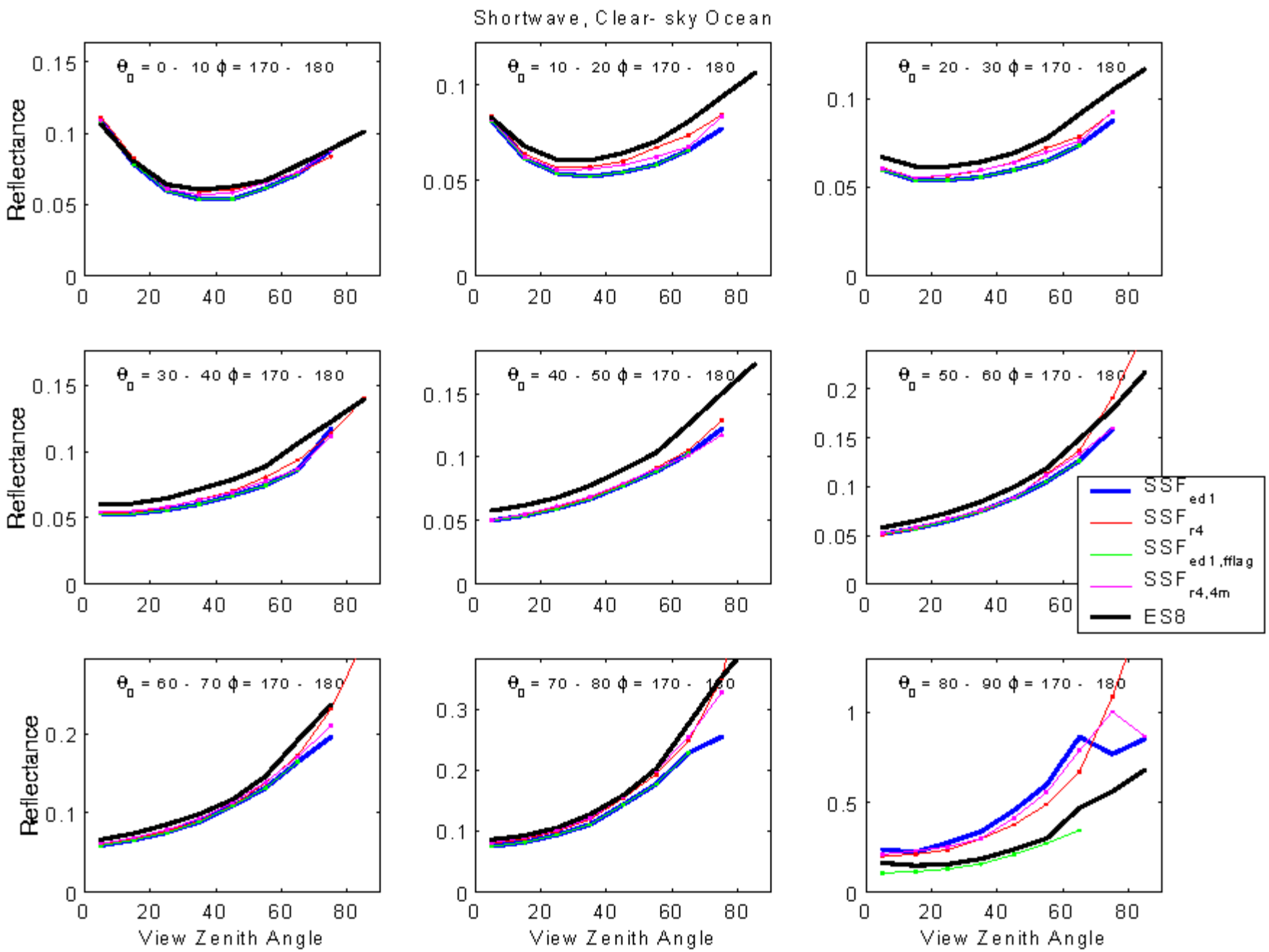
θ0 = 10 - 20 ϕ = 0 - 10
θ0 = 20 - 30 ϕ = 0 - 10
θ0 = 30 - 40 ϕ = 0 - 10
θ0 = 40 - 50 ϕ = 0 - 10
θ0 = 50 - 60 ϕ = 0 - 10
θ0 = 60 - 70 ϕ = 0 - 10
θ0 = 70 - 80 ϕ = 0 - 10
θ0 = 80 - 90 ϕ = 0 - 10
Reflectance
View Zenith Angle
SSFed1
SSFr4
SSFed1,fflag
SSFr4,4m
ES8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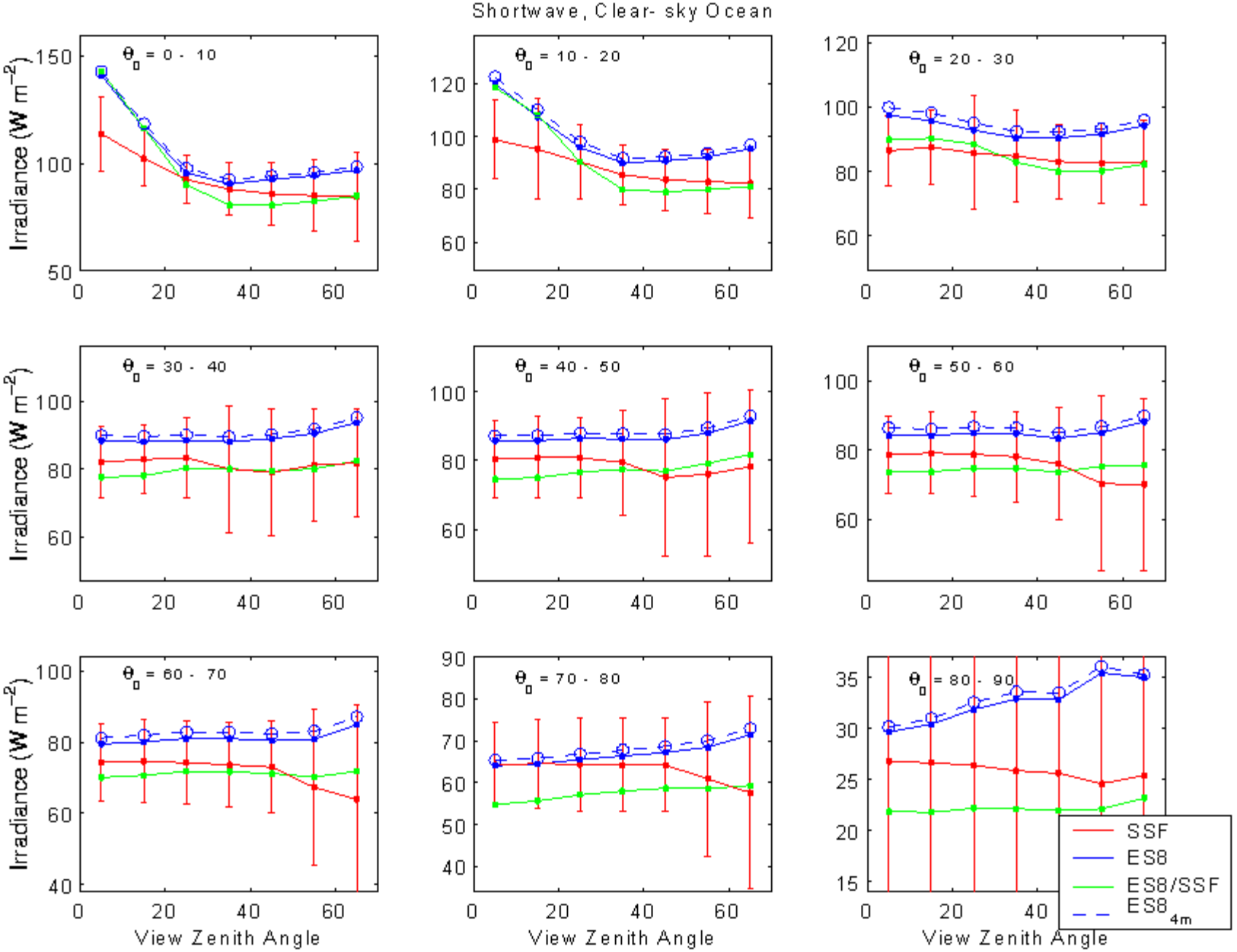
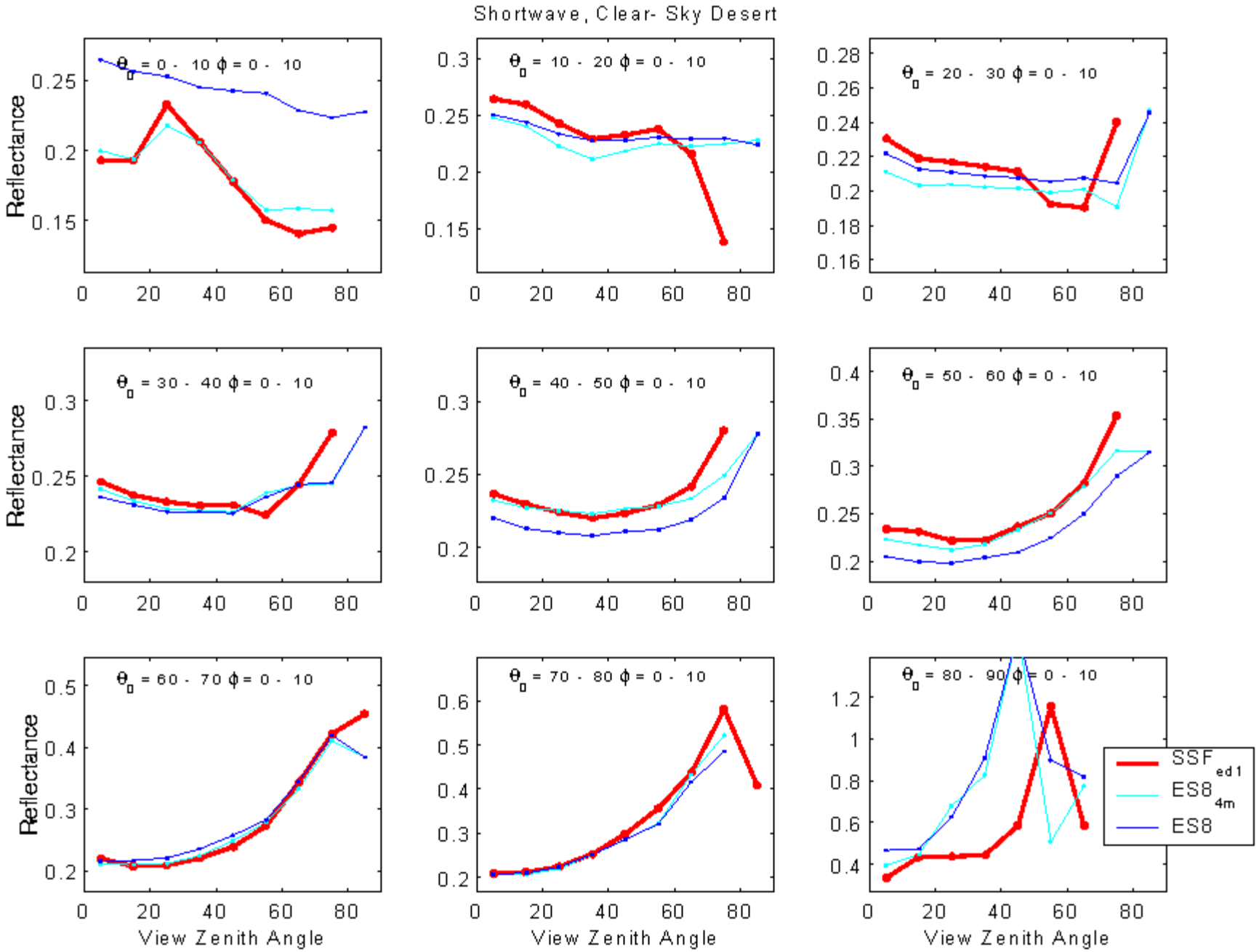
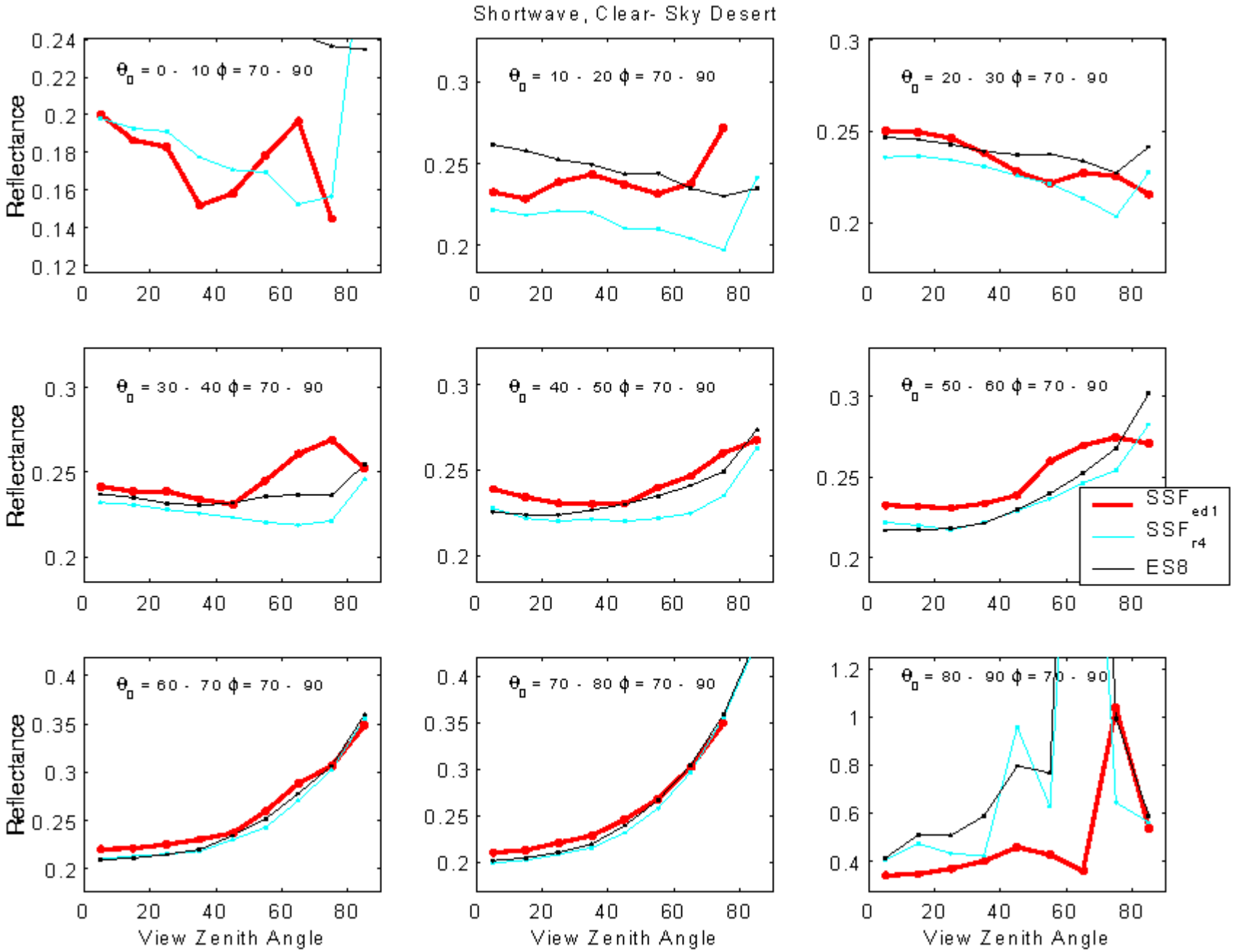
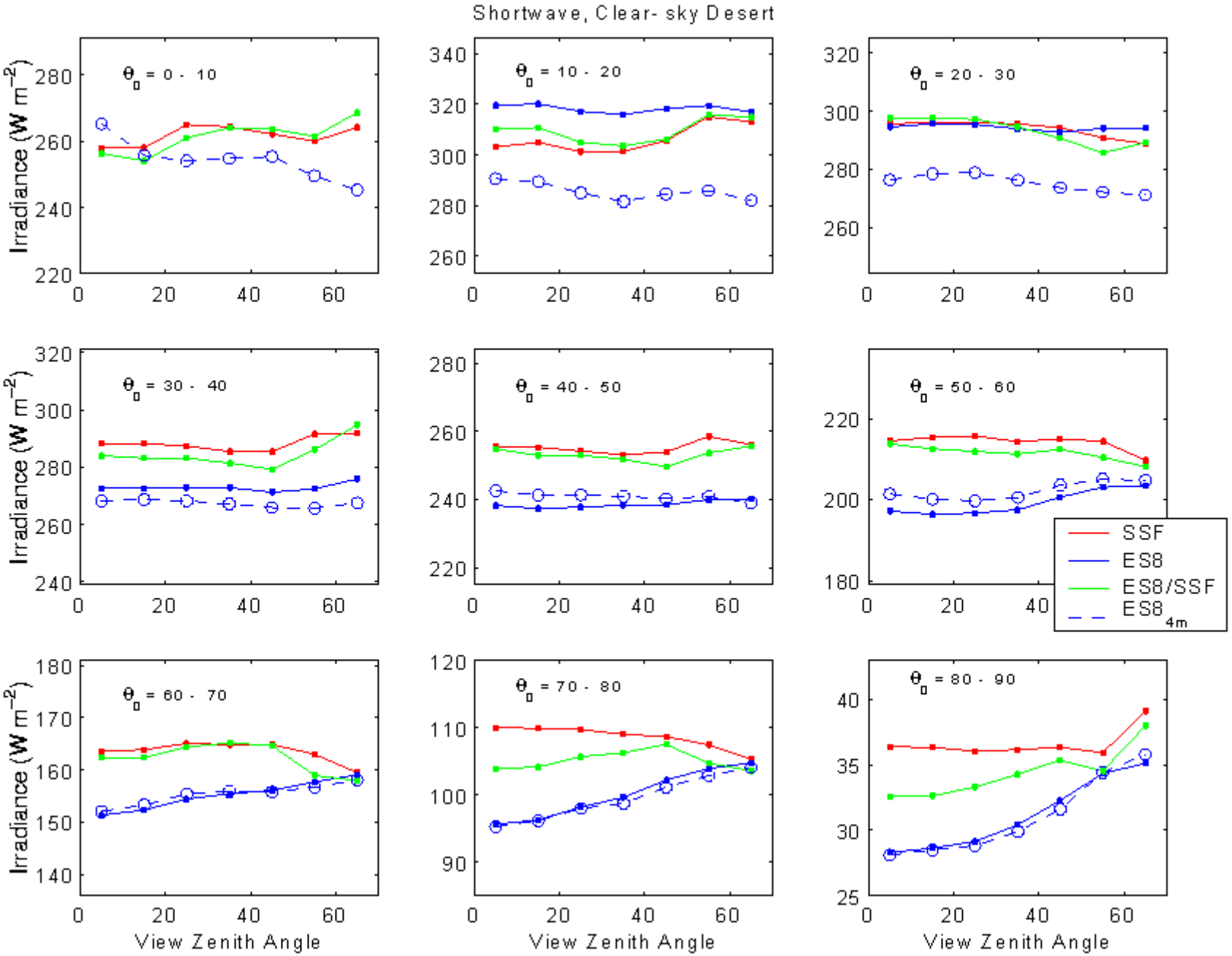
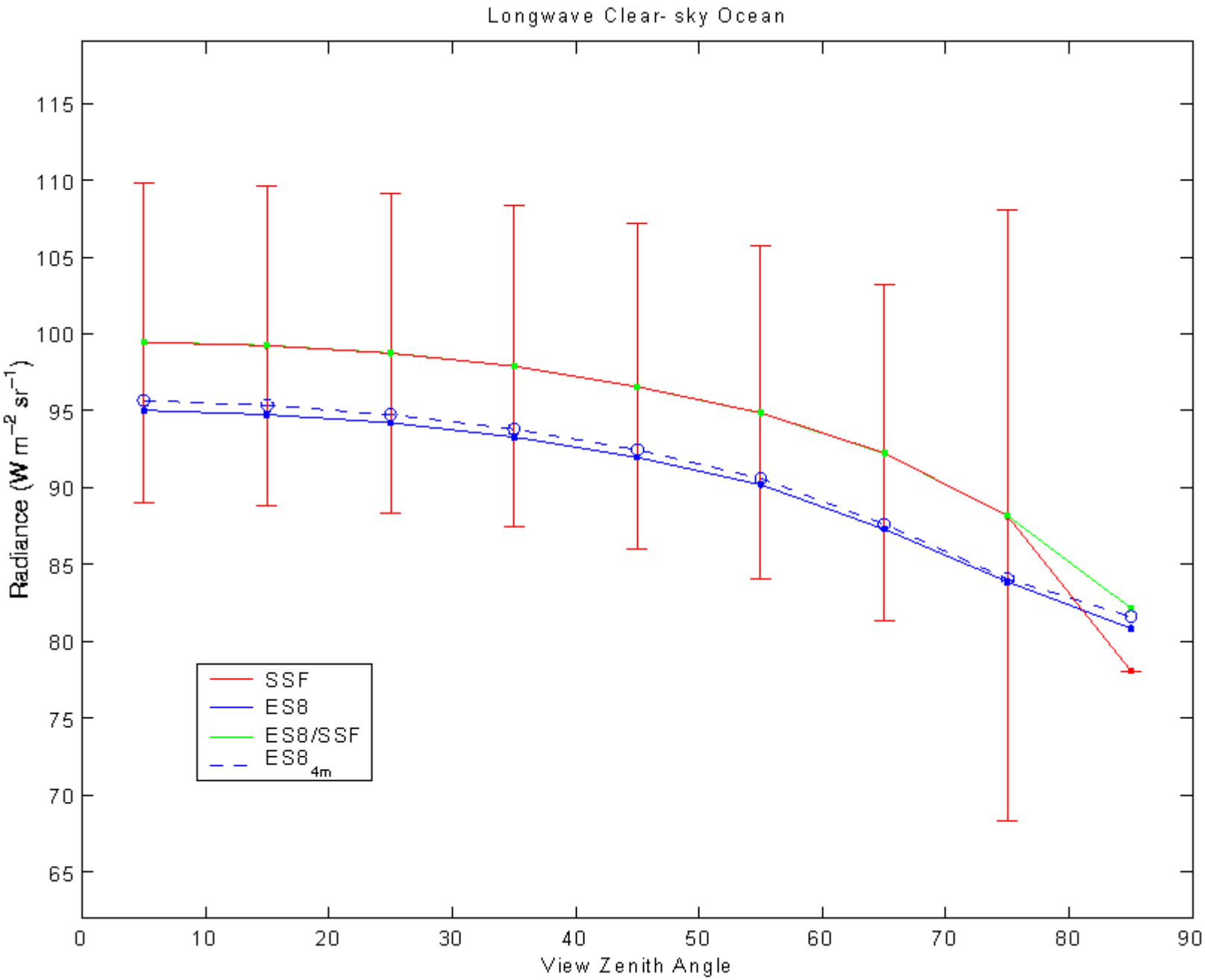
θ0 = 10 - 20 ϕ = 170 - 180
θ0 = 20 - 30 ϕ = 170 - 180
θ0 = 30 - 40 ϕ = 170 - 180
θ0 = 40 - 50 ϕ = 170 - 180
θ0 = 50 - 60 ϕ = 170 - 180
θ0 = 60 - 70 ϕ = 170 - 180
θ0 = 70 - 80 ϕ = 170 - 180
θ0 = 80 - 90 ϕ = 170 - 180
Reflectance
View Zenith Angle
SSFed1
SSFr4
SSFed1,fflag
SSFr4,4m
ES8


Shortwave, Clear- sky Ocean
θ0 = 0 - 10
θ0 = 10 - 20
θ0 = 20 - 30
θ0 = 30 - 40
θ0 = 40 - 50
θ0 = 50 - 60
θ0 = 60 - 70
θ0 = 70 - 80
θ0 = 80 - 90
Irradiance (W m−2)
View Zenith Angle
SSF
ES8
ES8/SSF
ES8 4m


Shortwave, Clear- Sky Desert
θ0 = 0 - 10 ϕ = 0 - 10
θ0 = 10 - 20 ϕ = 0 - 10
θ0 = 20 - 30 ϕ = 0 - 10
θ0 = 30 - 40 ϕ = 0 - 10
θ0 = 40 - 50 ϕ = 0 - 10
θ0 = 50 - 60 ϕ = 0 - 10
θ0 = 60 - 70 ϕ = 0 - 10
θ0 = 70 - 80 ϕ = 0 - 10
θ0 = 80 - 90 ϕ = 0 - 10
Reflectance
View Zenith Angle
SSF ed1
ES8 4m
ES8


Shortwave, Clear- Sky Desert
Reflectance
θ0 = 0 - 10 ϕ = 70 - 90
θ0 = 10 - 20 ϕ = 70 - 90
θ0 = 20 - 30 ϕ = 70 - 90
θ0 = 30 - 40 ϕ = 70 - 90
θ0 = 40 - 50 ϕ = 70 - 90
θ0 = 50 - 60 ϕ = 70 - 90
θ0 = 60 - 70 ϕ = 70 - 90
θ0 = 70 - 80 ϕ = 70 - 90
θ0 = 80 - 90 ϕ = 70 - 90
SSFed1
SSFr4
ES8
View Zenith Angle


Shortwave, Clear- sky Desert
θ0 = 0 - 10
θ0 = 10 - 20
θ0 = 20 - 30
θ0 = 30 - 40
θ0 = 40 - 50
θ0 = 50 - 60
θ0 = 60 - 70
θ0 = 70 - 80
θ0 = 80 - 90
Irradiance (W m−2)
View Zenith Angle
SSF
ES8
ES8/SSF
ES8 4m


Longwave Clear- sky Ocean
Radiance (W m^{-2} sr^{-1})
115
110
105
100
95
90
85
80
75
70
65
0
10
20
30
40
50
60
70
80
90
View Zenith Angle
SSF
ES8
ES8/SSF
ES8$_{4m}$

Clear-sky Ocean Mean radiance

1. The radiance in SSF ed 1 is higher than that in SSF r4 because of the scene ID difference in the sun glint region when the solar zenith angle is smaller than 30°.
2. The radiance in SSF ed 1 is lower than that in ES8 (except for the sun glint region and almost all angles when the solar zenith angle is greater than 80°).

Clear-sky Ocean Mean Irradiance

1. The irradiance in SSF ed 1 is lower than that in ES8 for all view zenith and solar zenith angles. An arithmetic average of 4 month of data is

SSF ed. 1	$73.8 \mathrm{Wm}^{-2}$
ES8/SSF	$72.1 \mathrm{Wm}^{-2}$
ES8 (4months)	$81.3 \mathrm{Wm}^{-2}$
ES8 (8months)	$79.5 \mathrm{Wm}^{-2}$

2. The irradiacne increases as the view zenith angle decreases when the solar zenith angle is between 0 to 10 degrees because of scene ID difference between r4 and ed. 1.

Clear-sky Desert

1. The radiance and irradiance in SSF ed. 1 is greater than those in ES8, which caused by scene ID difference.