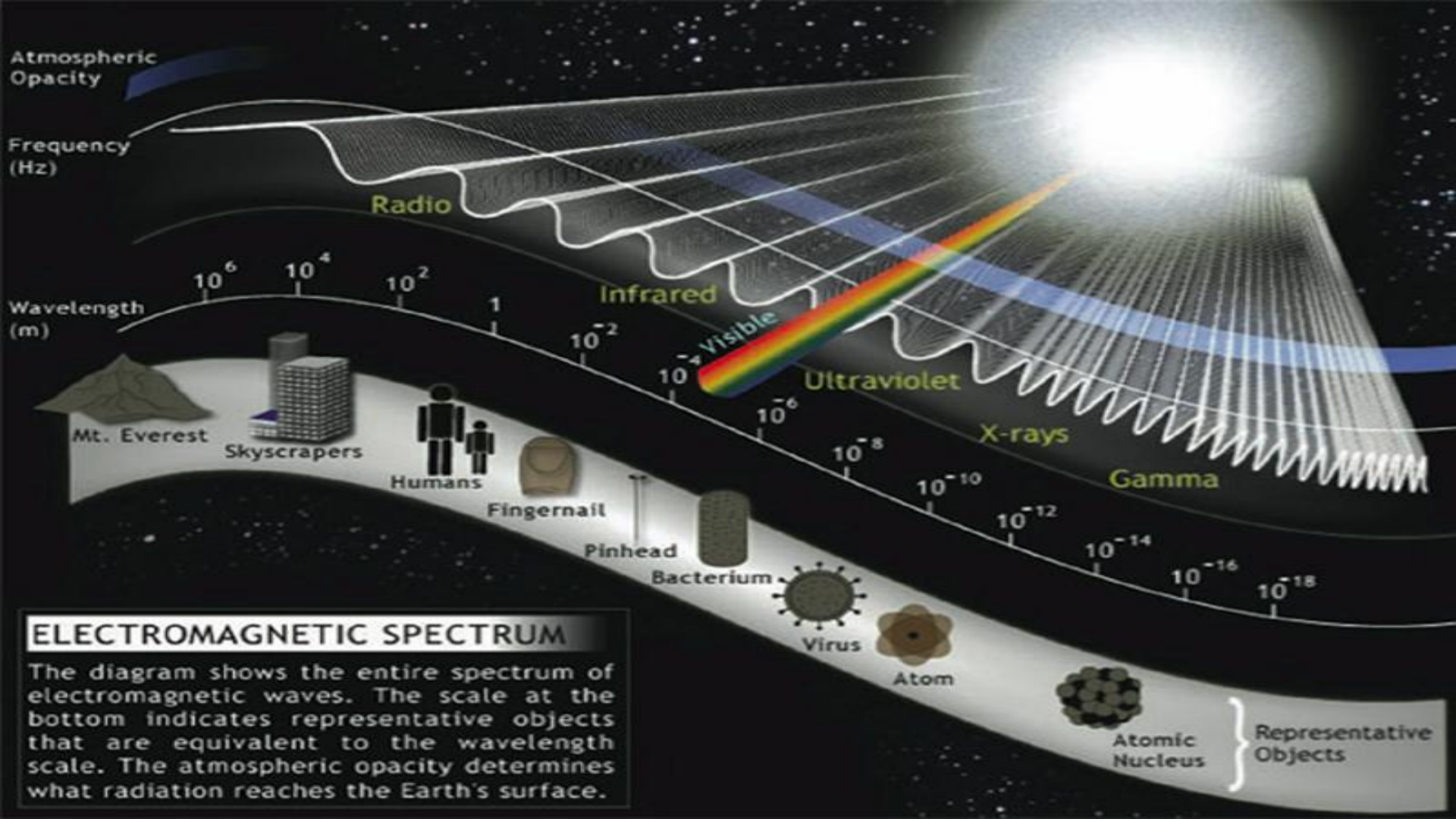
Predicting the Spectrum's Spectre

A PI4-Bootcamp Project by Iftikhar Ahmed et al.



ELECTROMAGNETIC SPECTRUM

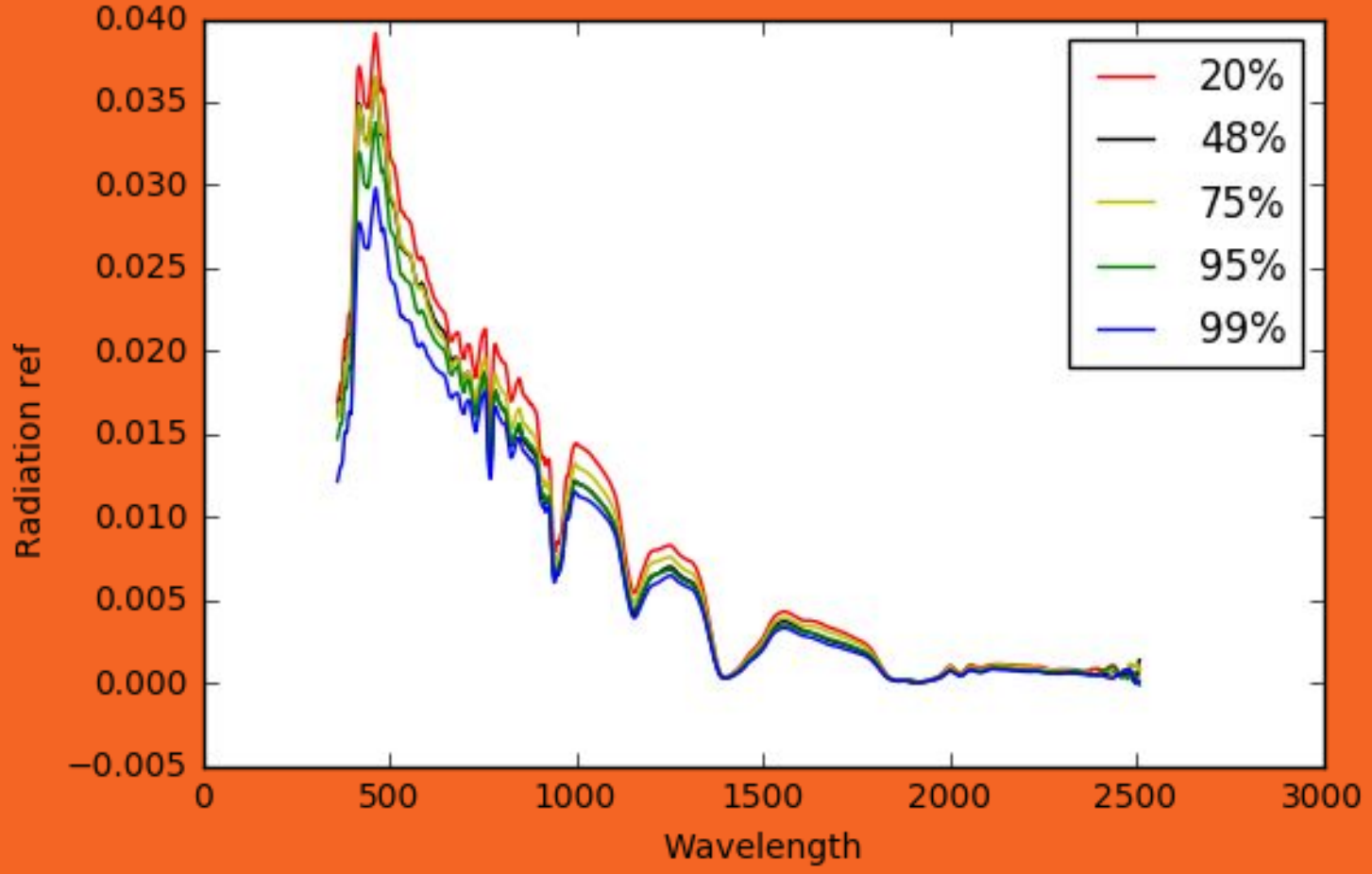
The diagram shows the entire spectrum of electromagnetic waves. The scale at the bottom indicates representative objects that are equivalent to the wavelength scale. The atmospheric opacity determines what radiation reaches the Earth's surface.

Reflectance Targets

The Data Sets

	Wvl	Raw.Counts..Ref..	Rad...Ref..	Raw.Counts..Target.	Rad...Target.	X.log.Reflect.	Reflect...
1	346.2	3885	0.01381118	378	0.0006718950	1.31293	4.865
2	347.8	4293	0.01449746	412	0.0006956620	1.31889	4.799
3	349.4	4807	0.01592559	465	0.0007702725	1.31545	4.837
4	351.0	5106	0.01700809	495	0.0008244225	1.31451	4.847
5	352.6	5088	0.01788941	494	0.0008684520	1.31385	4.855
6	354.1	4854	0.01874615	484	0.0009346040	1.30228	4.986
7	355.7	4244	0.01772294	439	0.0009166320	1.28634	5.172
8	357.3	3504	0.01593619	384	0.0008732160	1.26126	5.479
9	358.9	3177	0.01512252	359	0.0008544200	1.24795	5.650
10	360.5	3187	0.01520836	365	0.0008708900	1.24212	5.726
11	362.0	3376	0.01530341	390	0.0008839350	1.23837	5.776
12	363.6	3701	0.01622889	436	0.0009559300	1.22986	5.890
13	365.2	4030	0.01744990	477	0.0010327050	1.22782	5.918
14	366.8	4153	0.01858052	501	0.0011207370	1.21955	6.032

Initial Plots



Data Labels

20% 17:05:58
48% 17:06:55
75% 17:07:33
95% 17:09:02
99% 17:09:43

Cleaning The Data

	Wvl	Raw.Counts..Ref..	Rad...Ref..	Raw.Counts..Target.	Rad...Target.	X.log.Reflect.	Reflect...
1	346.2	3885	0.01381118	378	0.0006718950	1.31293	4.865
2	347.8	4293	0.01449746	412	0.0006956620	1.31889	4.799
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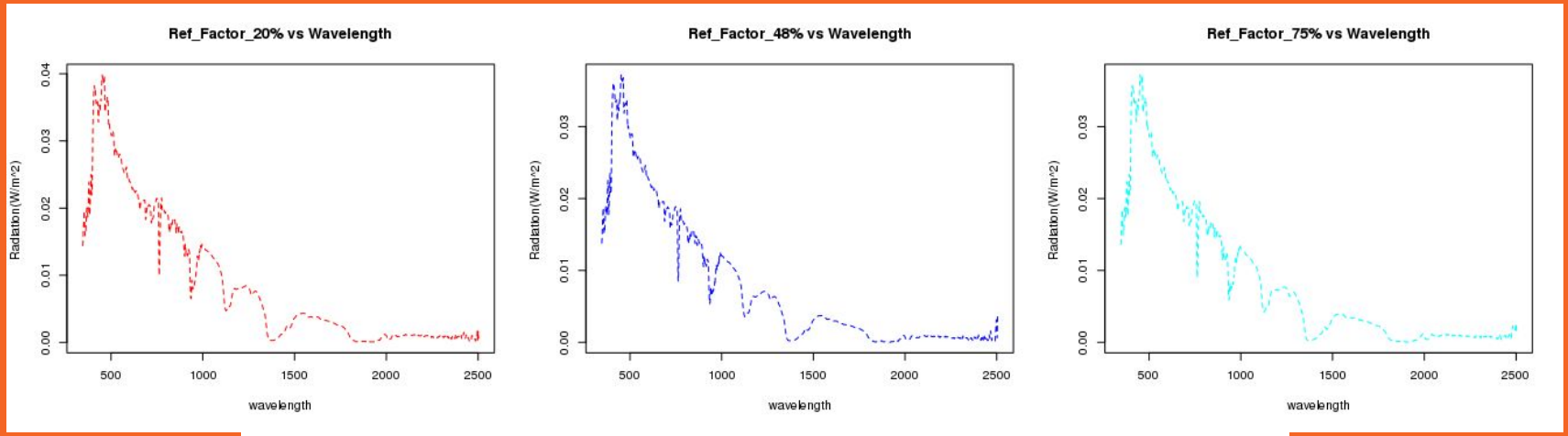
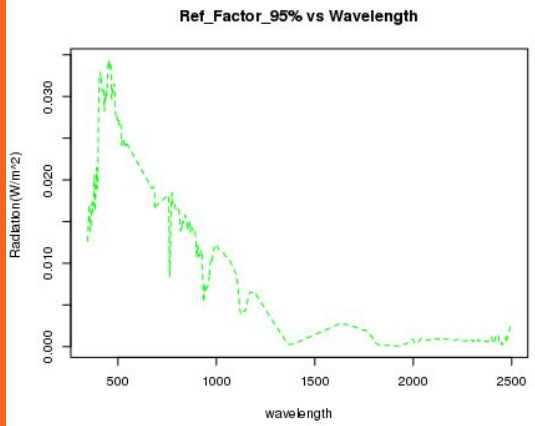
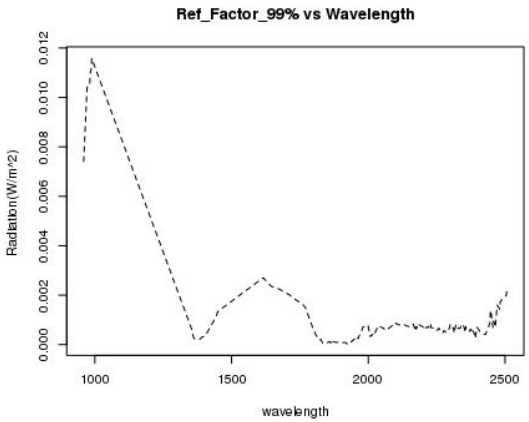
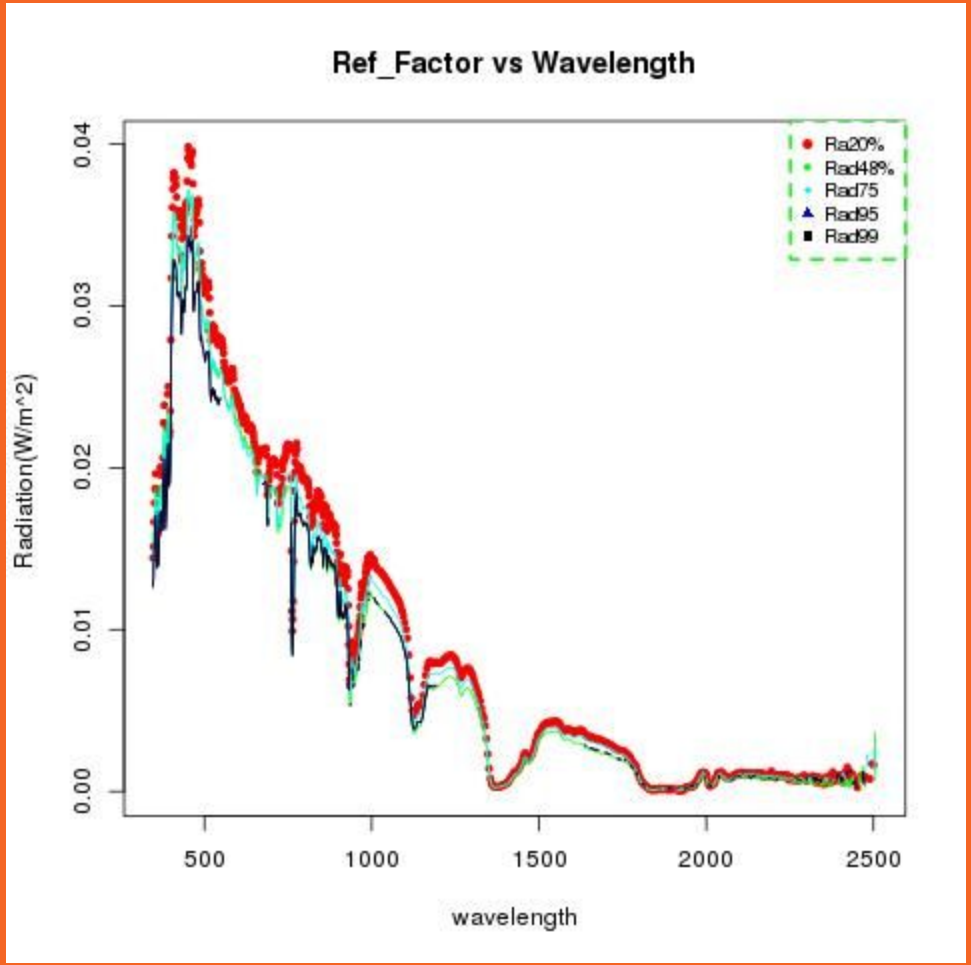
Cleaned Plots

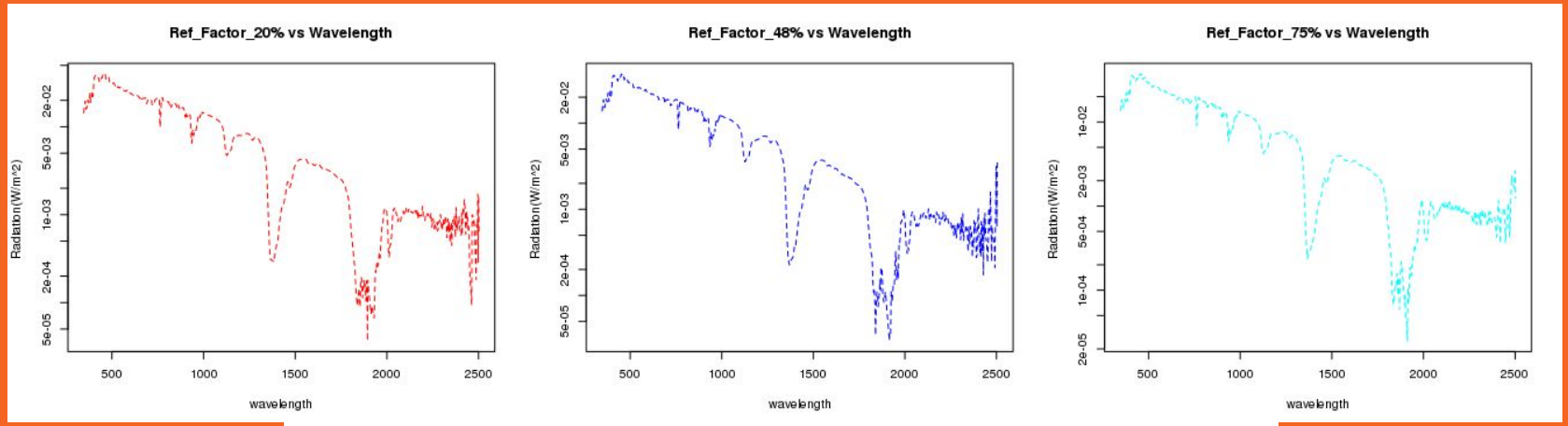






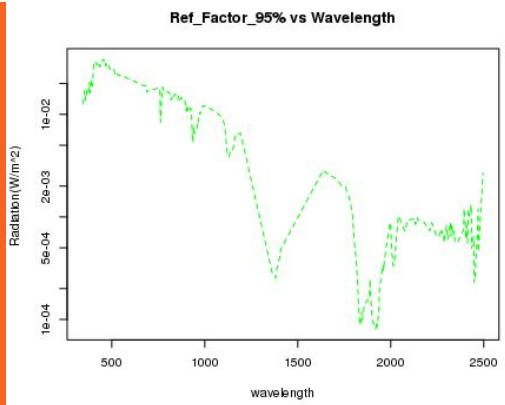

Ref_Factor vs Wavelength
Ra20%
Rad48%
Rad75
Rad95
Rad99
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength

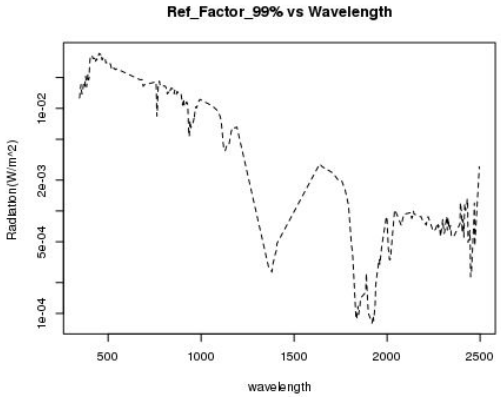
Log Plots


Ref_Factor_20% vs Wavelength
Radiation(W/m^2)
5e-05
2e-04
1e-03
5e-03
2e-02
500
1000
1500
2000
2500
wavelength

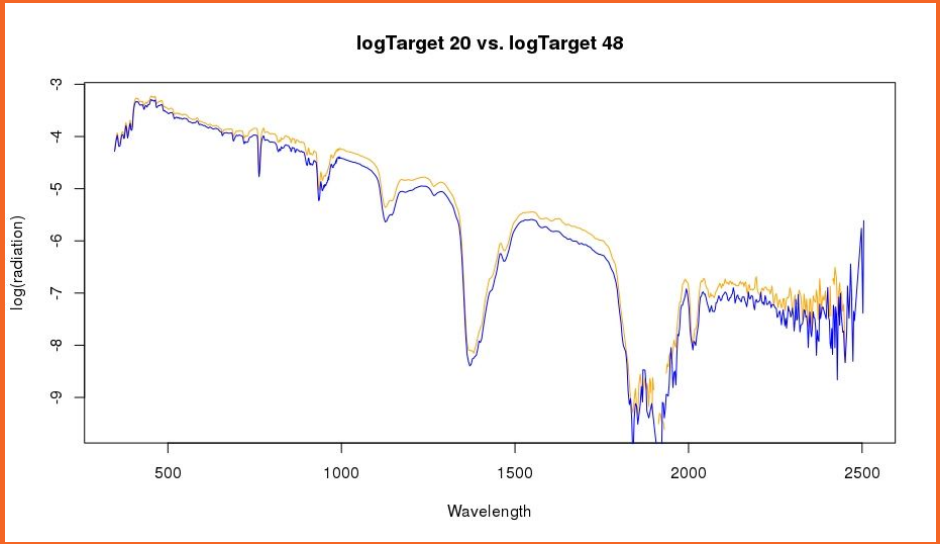
Ref_Factor_48% vs Wavelength
Radiation(W/m^2)
5e-05
2e-04
1e-03
5e-03
2e-02
500
1000
1500
2000
2500
wavelength

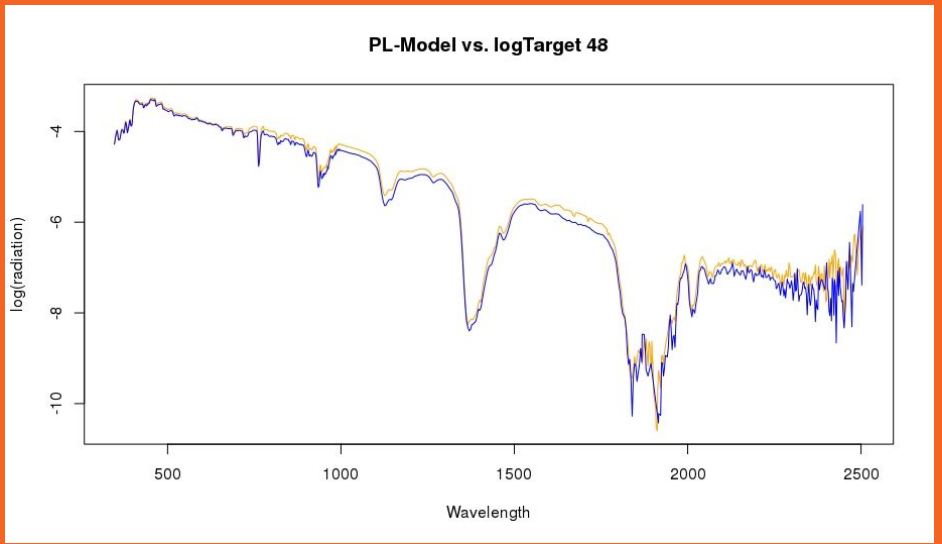
Ref_Factor_75% vs Wavelength
Radiation(W/m^2)
2e-05
1e-04
5e-04
2e-03
1e-02
500
1000
1500
2000
2500
wavelength


Ref_Factor_95% vs Wavelength
Radiation(W/m^2)
1e-04
5e-04
2e-03
1e-02
500
1000
1500
2000
2500
wavelength

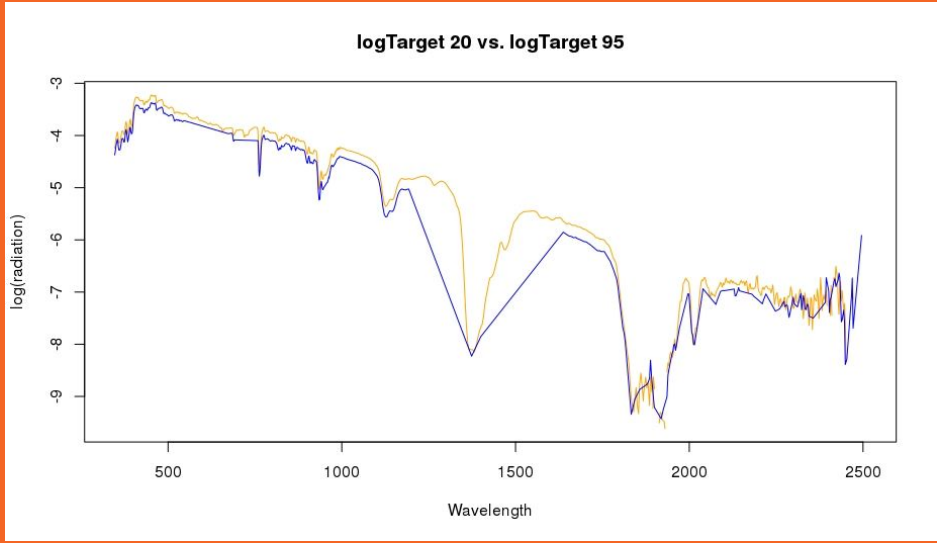

Ref_Factor_99% vs Wavelength
Radiation(W/m^2)
1e-04
5e-04
2e-03
1e-02
500
1000
1500
2000
2500
wavelength

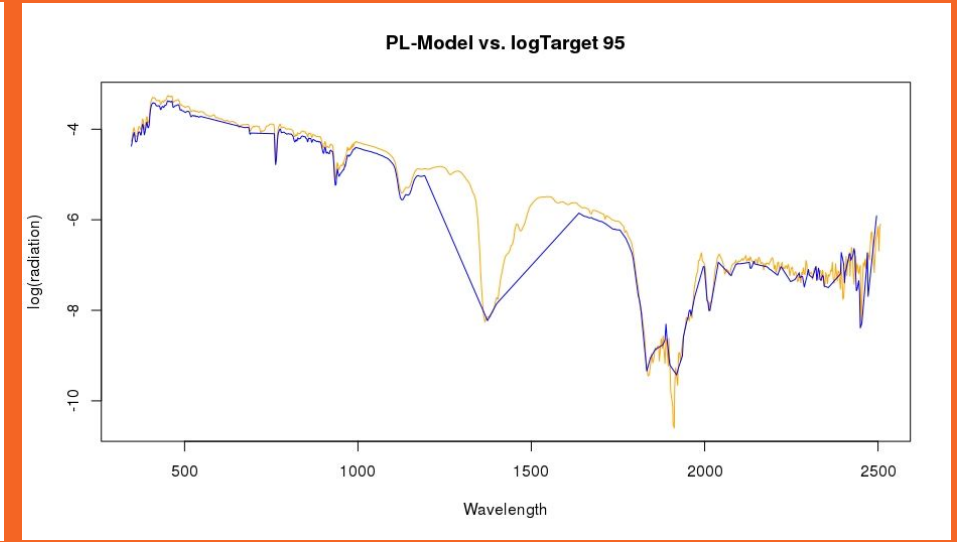
Piecewise Linear Model

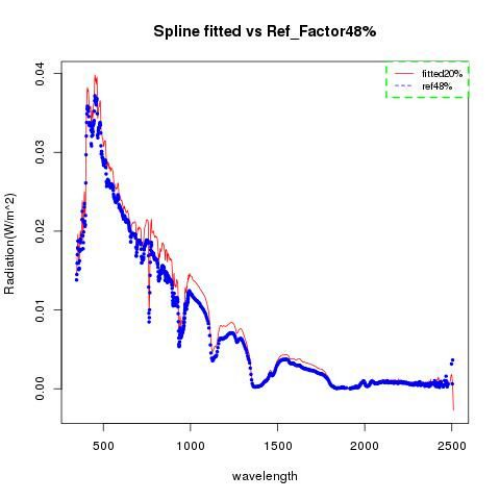


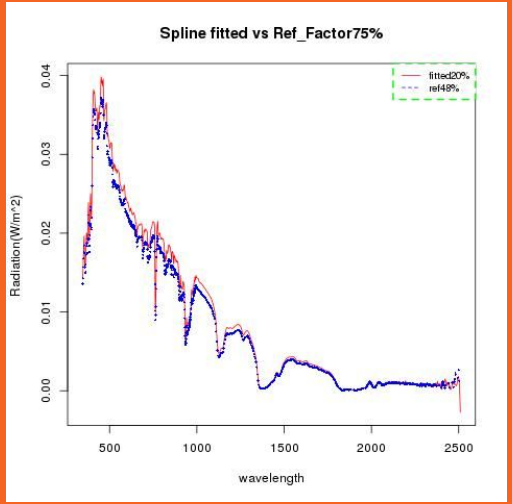


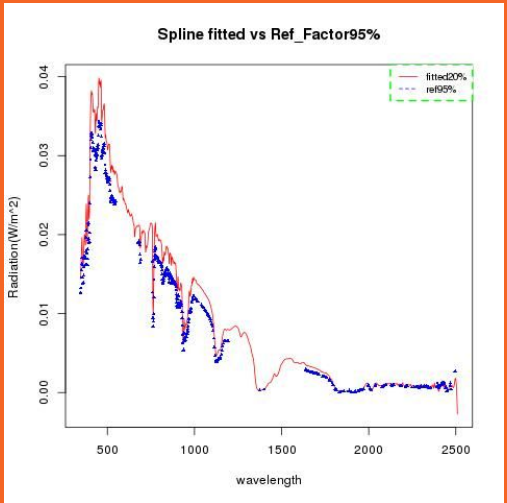
Piecewise Linear Model

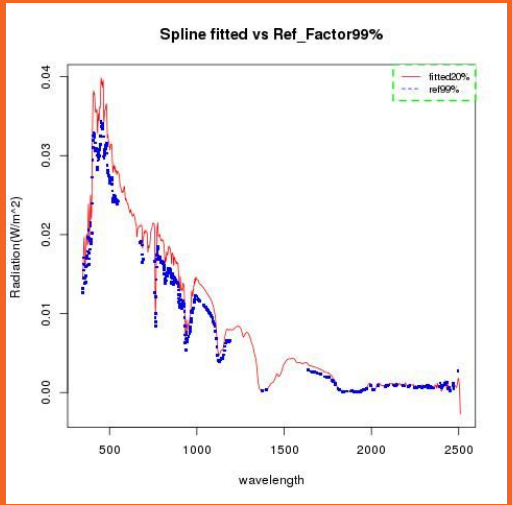


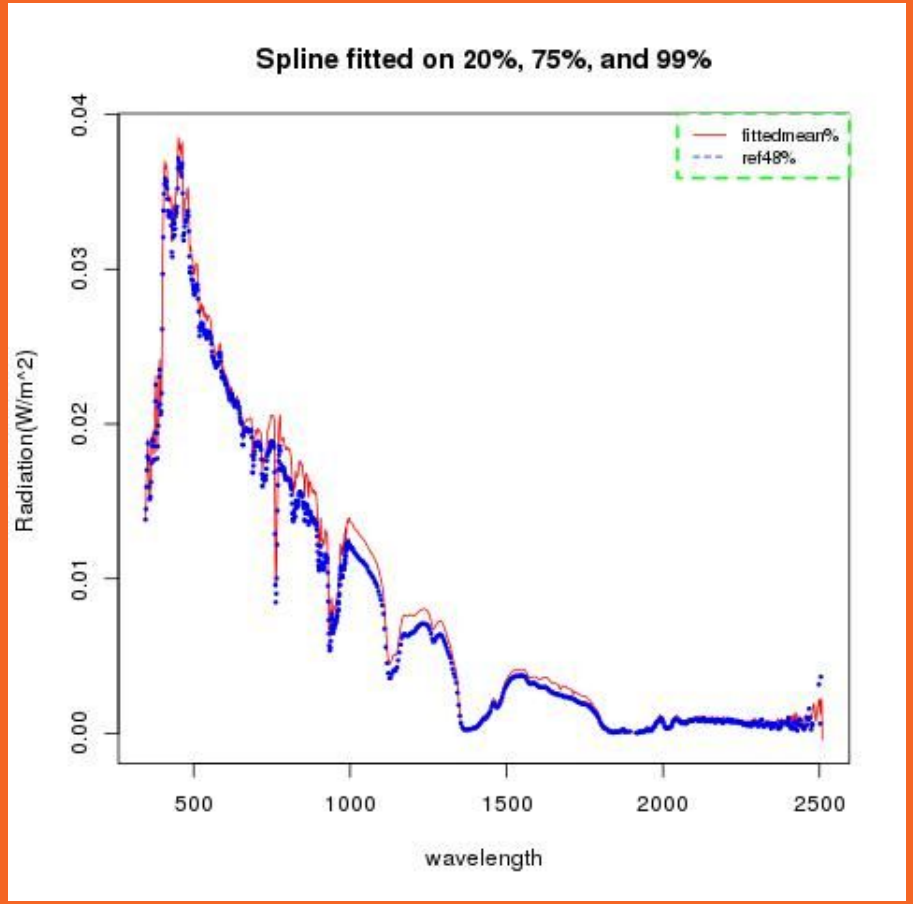


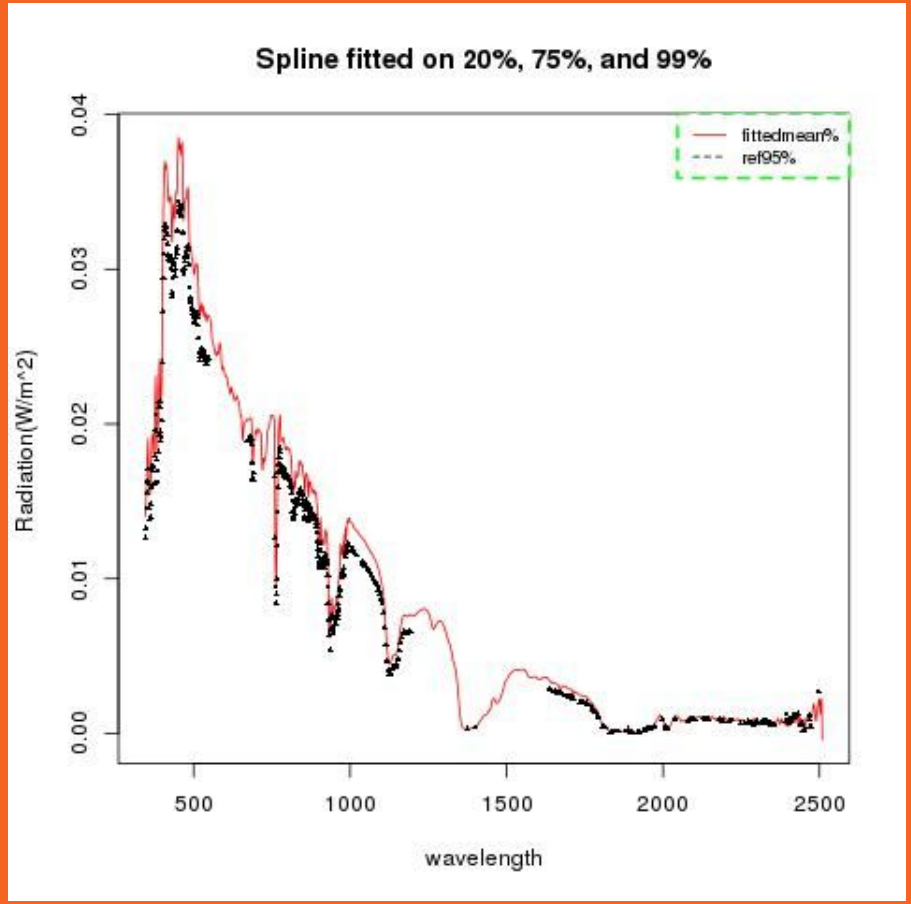

Spline fitted vs Ref_Factor48%
fitted20%
ref48%
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength


Spline fitted vs Ref_Factor75%
fitted20%
ref48%
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength

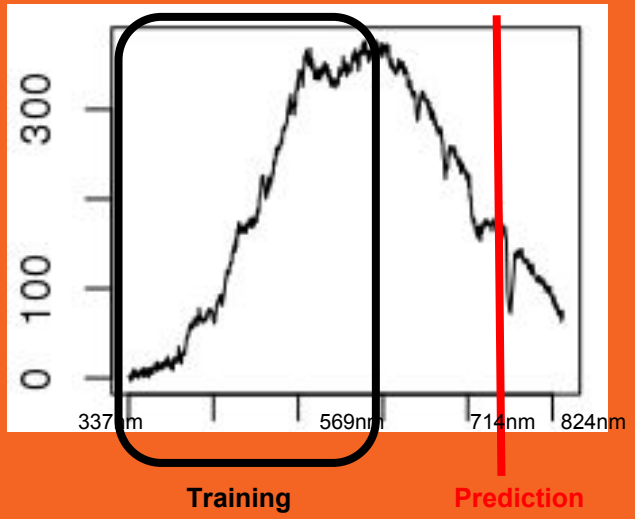

Spline fitted vs Ref_Factor95%
fitted20%
ref95%
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength

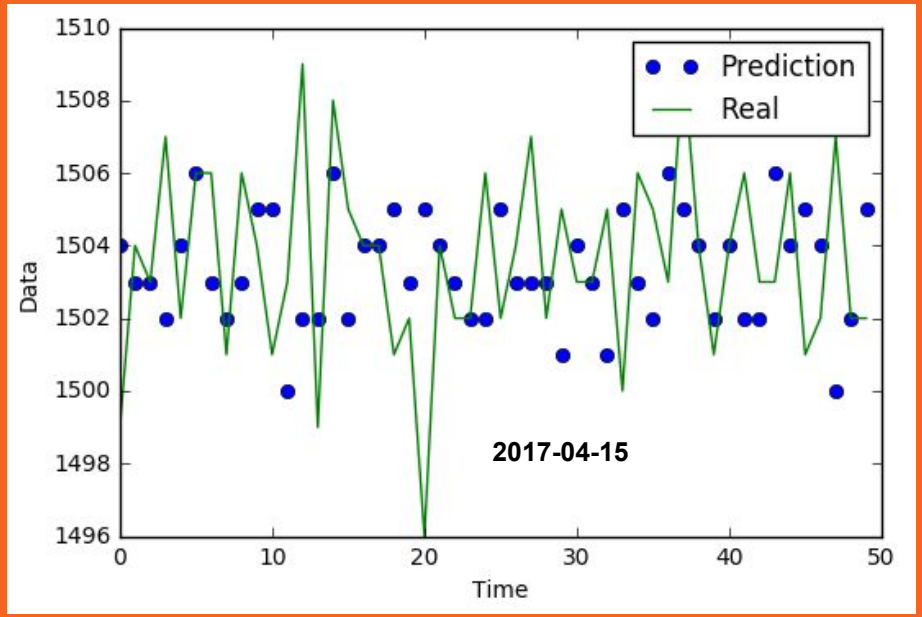

Spline fitted vs Ref_Factor99%
fitted20%
ref99%
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength


Spline fitted on 20%, 75%, and 99%
fittedmean%
ref48%
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength


Spline fitted on 20%, 75%, and 99%
fittedmean%
ref95%
Radiation(W/m^2)
0.00
0.01
0.02
0.03
0.04
500
1000
1500
2000
2500
wavelength

Data training and prediction





Thank You!