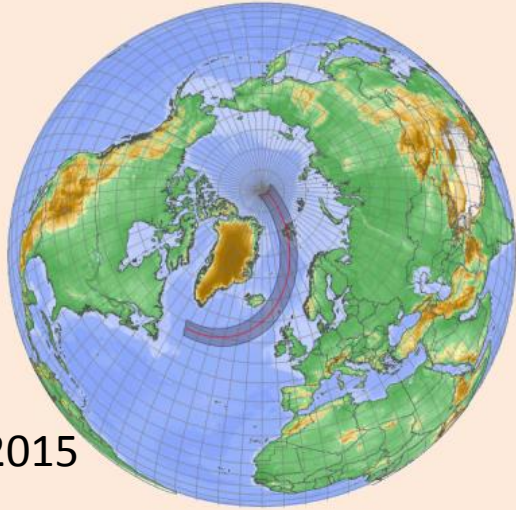




**SEC 2014**  
**Jay Anderson**  
**Canada**

# Outline



2015



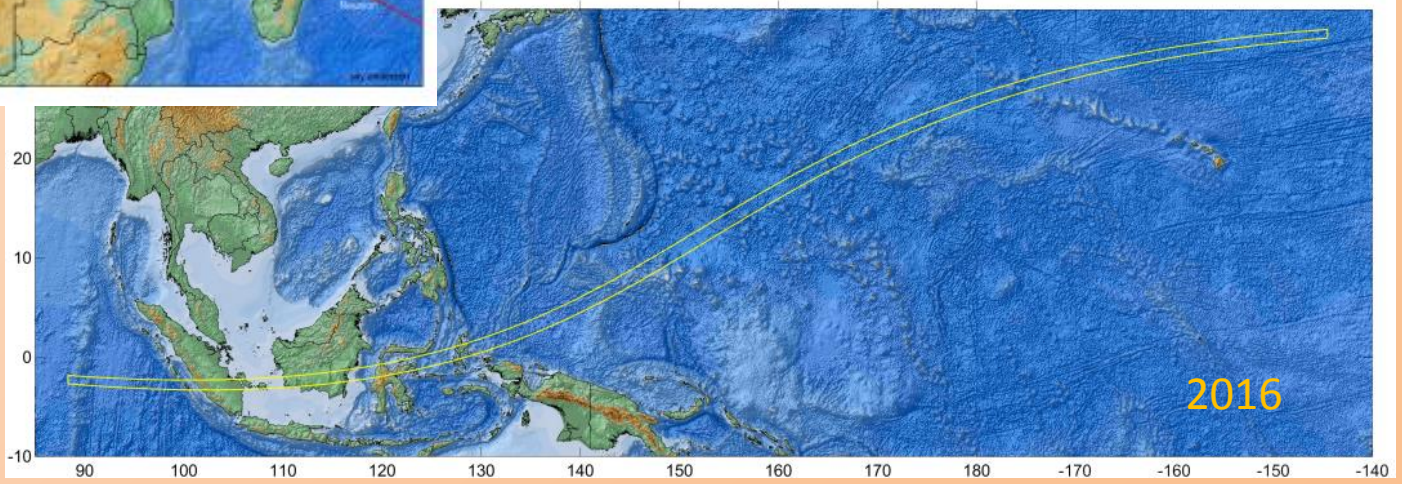
2016

Central Line  
Annular Solar Eclipse  
September 1, 2016



2017

Path of the Total Solar Eclipse  
2017 August 21



2016



A wide-angle photograph of a snowy mountain valley in Svalbard, Norway. The foreground is a vast, flat expanse of snow. In the middle ground, a small settlement of dark buildings is nestled in a valley. Beyond the settlement, a body of water is visible, surrounded by snow-covered mountains. The sky is a clear, pale blue. The overall scene is a stark, high-altitude winter landscape.

# Svalbard (Longyearbyen)

# Svalbard & Bear Island: March Climate Statistics for the Solar Eclipse

March 20 2015

Location	Percent of possible sunshine	Time of cloud data (UTC)	Percent sky cover in categories						Calculated Mean Cloud Amount (%)
			Clear	Few	Scattered	Broken	Overcast	Obscured	
<b>Bear Island</b>									
Bjornoya	16.4	10	0	4.3	12.1	57.1	22.2	4.3	77
<b>Spitzbergen Island</b>									
Hopen		9	4.6	16.9	9.8	35.4	30.3	3.1	68
Hornsund		9	2.3	19.4	9.4	40.1	26	2.8	67
Ny-Alesund		12	2.4	27	12.5	34	19.1	5	60
Svalbard Lufthavn (Longyearbyen)		10	1.1	26.2	19.3	48.9	0.9	3.7	55
Barentsburg		9	3.7	12.8	6.4	53.7	23.2	0.3	70
	Average Tmax	Highest Tmax	Average Tmin	Lowest Tmin	Days with fog @ 10 UTC	Days with snow @10 UTC	Days with rain @10 UTC	Days with pcpn @ 10 UTC	Monthly pcpn
<b>Bear Island</b>									
Bjornoya	-5		-11		1.4	7.1	1	7.7	28
<b>Spitsbergen Island</b>									
Hopen	-8		-14		2.8	7.3	0.4	4.1	33
Hornsund									32
Nye-Alesund									23
Svalbard Lufthavn (Longyearbyen)	-13	6.0	-20	-43.6	0.3	3.8	0.4	4.2	24
Barentsburg	-9	4.2	-15	-39.6	1.4	9.5	0.3	9.8	54





Longyearbyen

Road 400

aloft



surface

2829 m

© 2014 Google  
Image NASA  
Image © 2014 DigitalGlobe



Looking back toward Longyearbyen along the Road 400



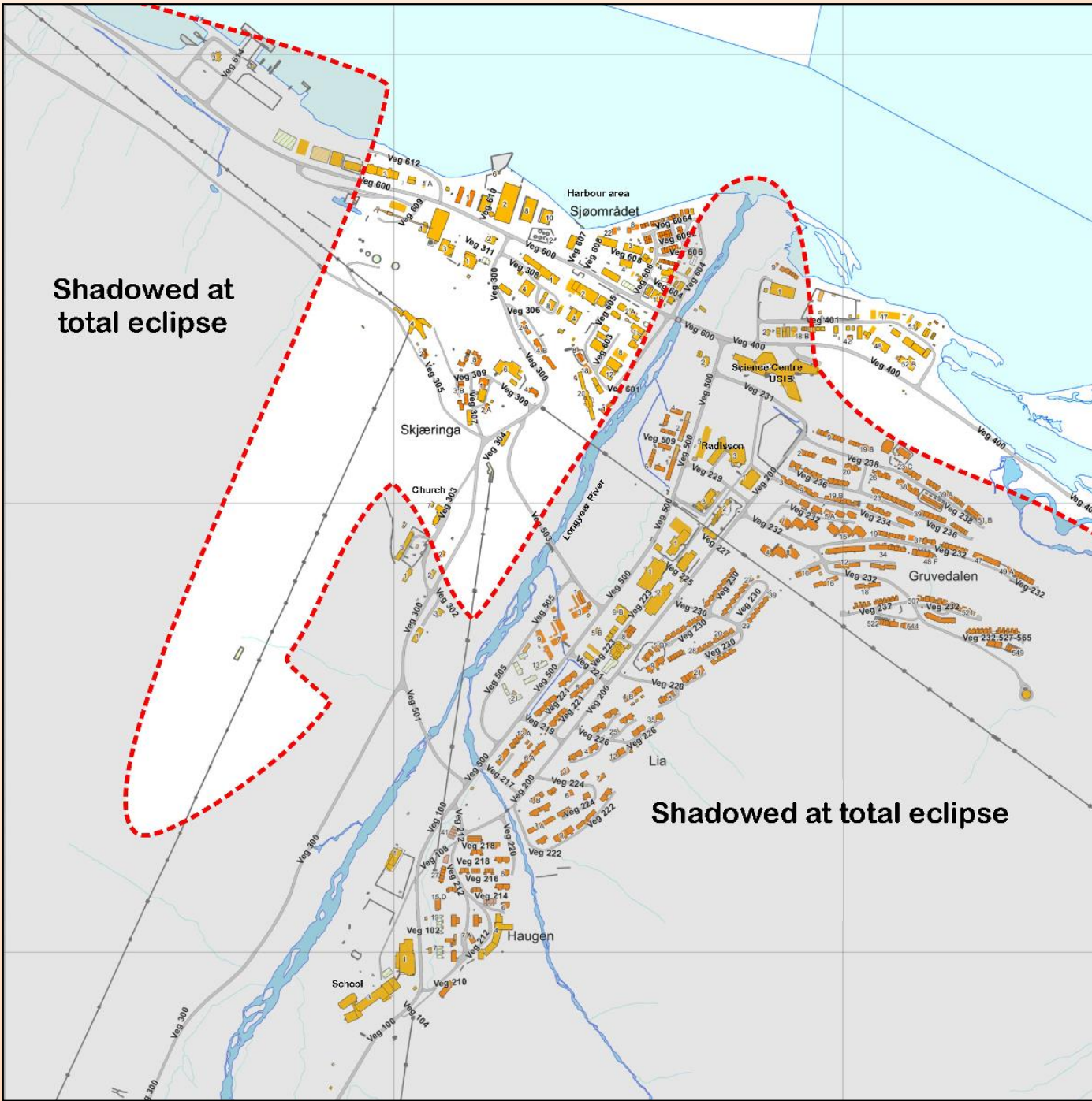


**Longyearbyen panorama March 22, 2012 10:10 UTC (maximum eclipse)**



**Longyearbyen east road panorama (March 19, 2012 09:23 UTC)**

**Shadowed at total eclipse**



**Shadowed at total eclipse**





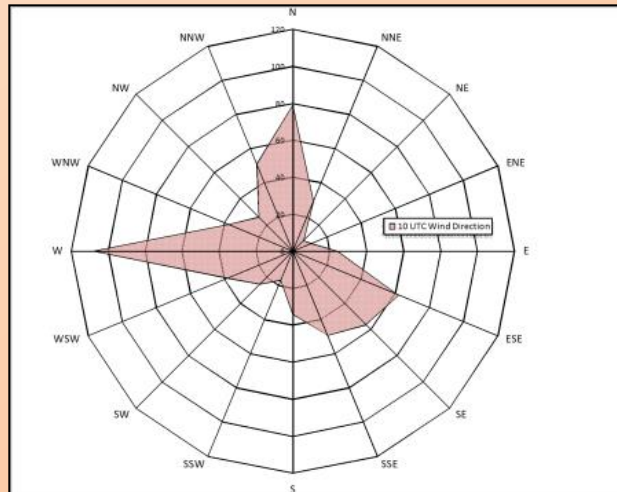
# Faroe Islands



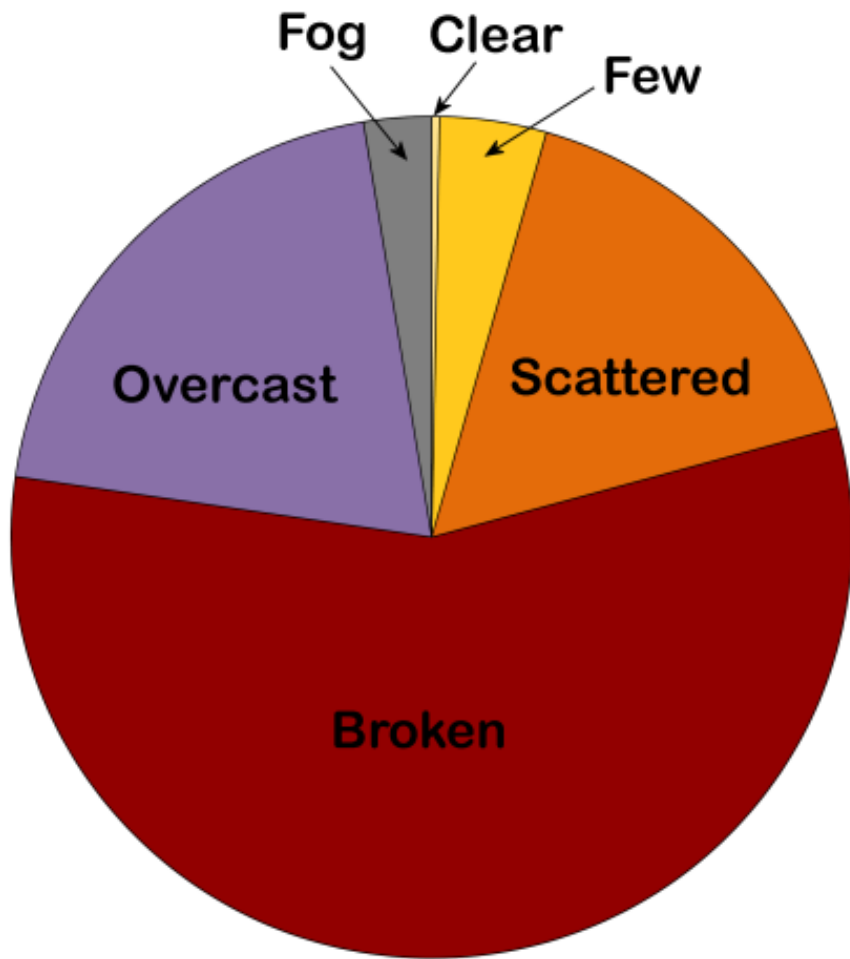
# The Faroe Islands: March Climate Statistics for the Solar Eclipse

## March 20 2015

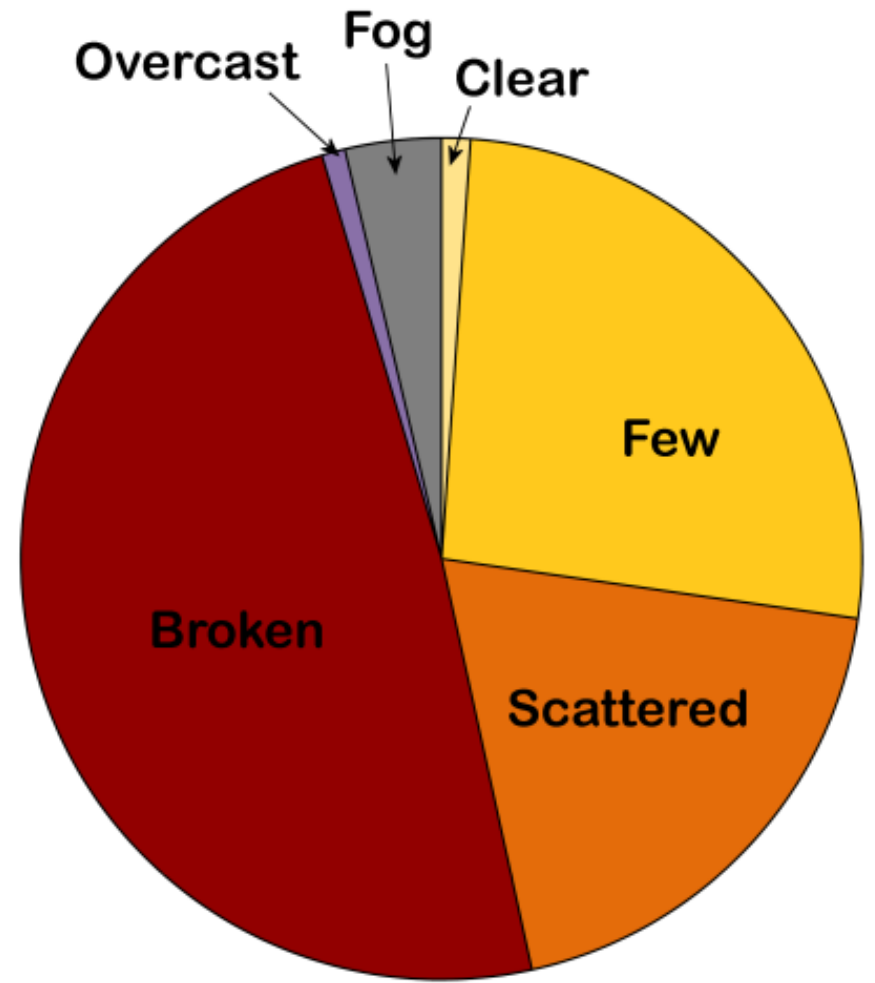
Location	Percent of possible sunshine	Time of cloud data (UTC)	Percent sky cover in categories						Calculated Mean Cloud Amount (%)
			Clear	Few	Scattered	Broken	Overcast	Obscured	
<b>Faroe Islands</b>									
Vagar airport	—	10	0.4	5	16.7	63.2	12	2.7	72
Torshavn Radiosonde	24	09	1.7	4.8	9.5	47.8	34.4	1.9	79
Akraberg	—	09	0.8	5	19	37.2	33.1	5	76
	Average Tmax °C	Highest Tmax °C	Average Tmin °C	Lowest Tmin °C	Days with fog @ 9 UTC	Days with snow @9 UTC	Days with rain @9UTC	Days with pcpn @ 9 UTC	Monthly pcpn (mm)
Vagar airport	5.2	—	0.9	—	0.7	4.0	9.3	13	141
Torshavn Radiosonde	5.9	15	1.5	-9	0.4	3.8	6.7	10.5	132
Akraberg	5.5	11	2	-5	—	—	—	24	77



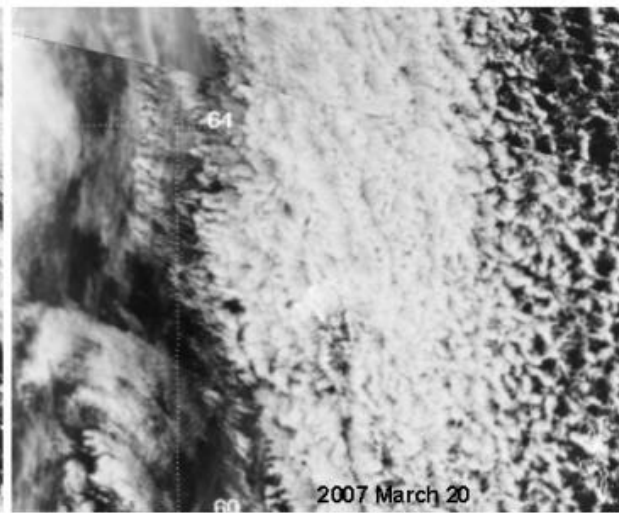
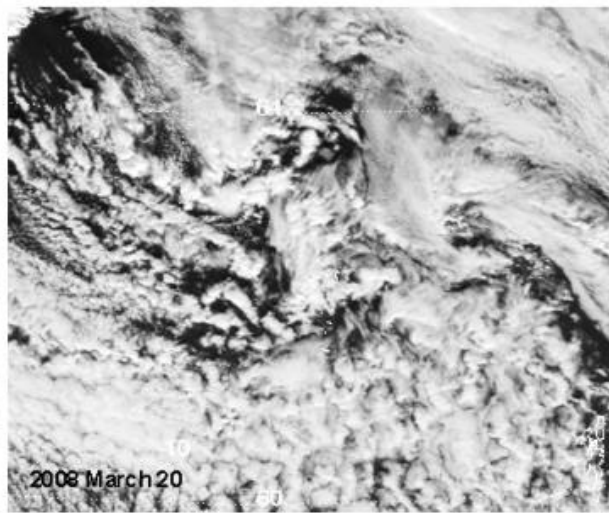
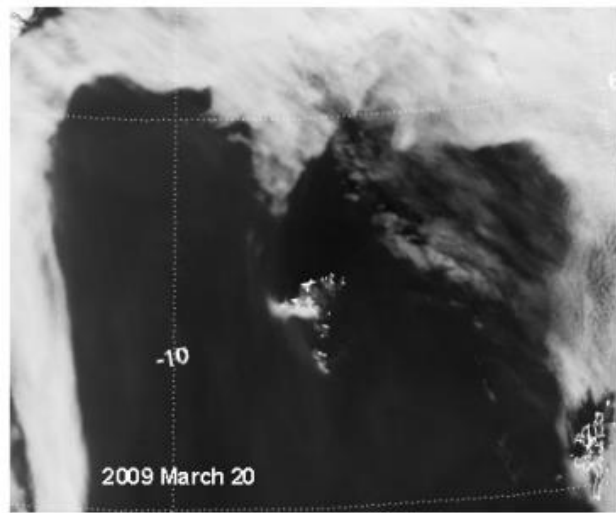
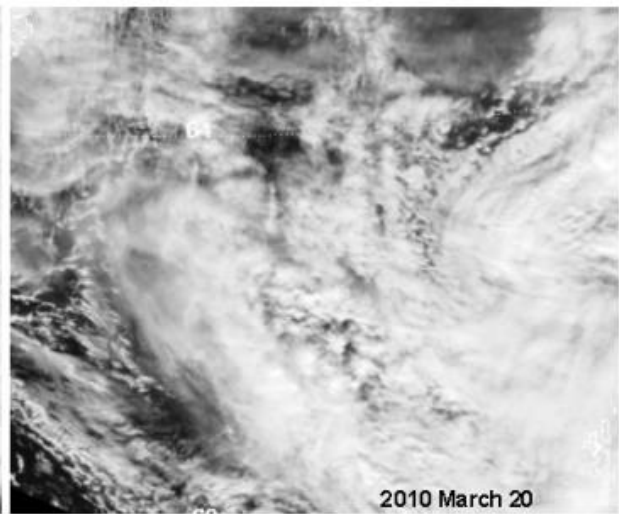
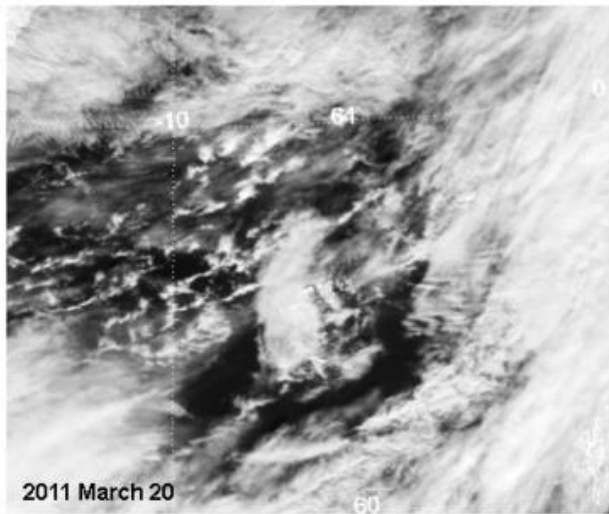
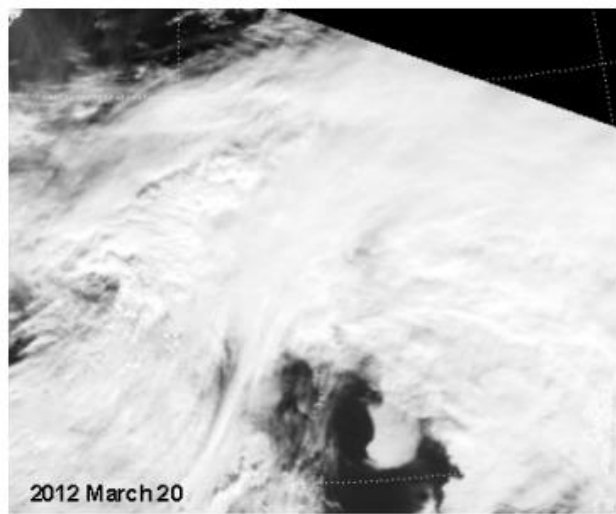




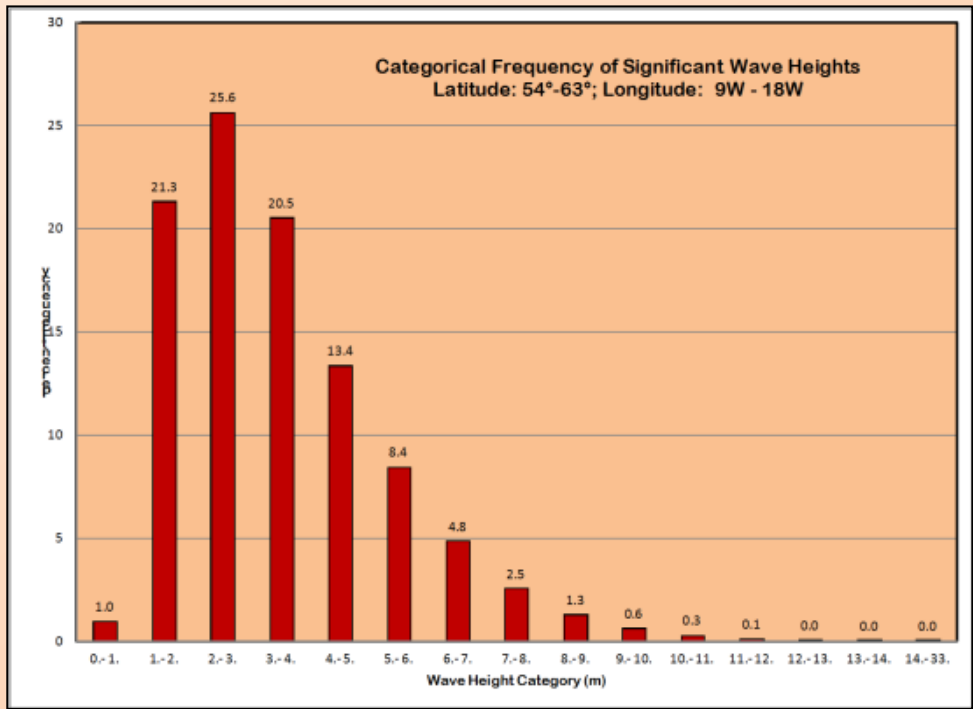
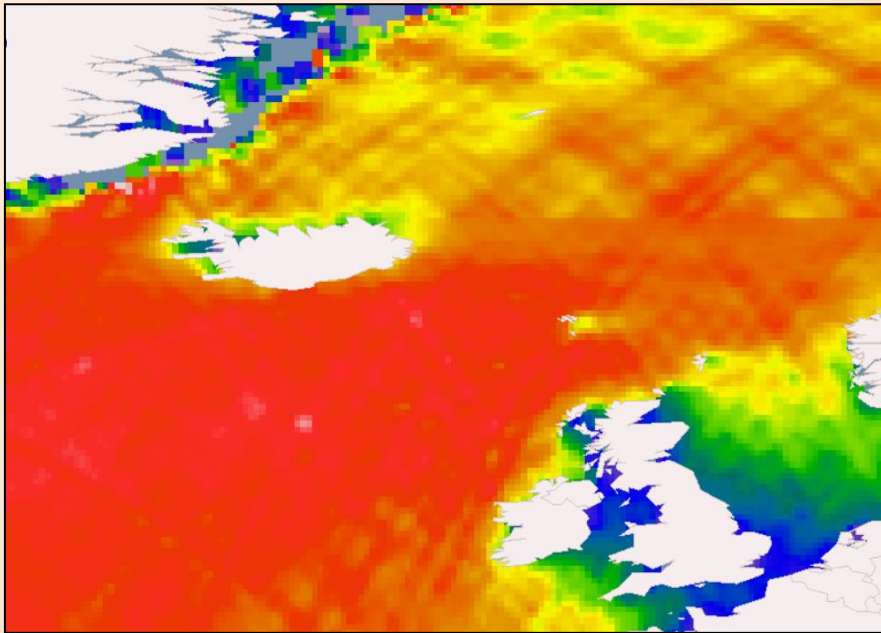
Vagar



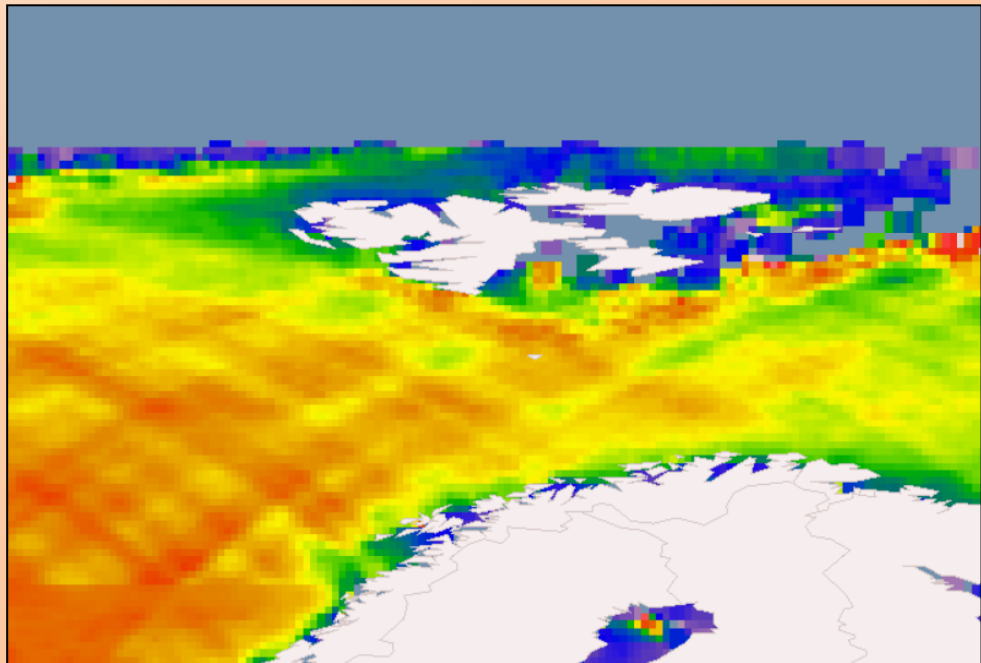
Longyearbyen



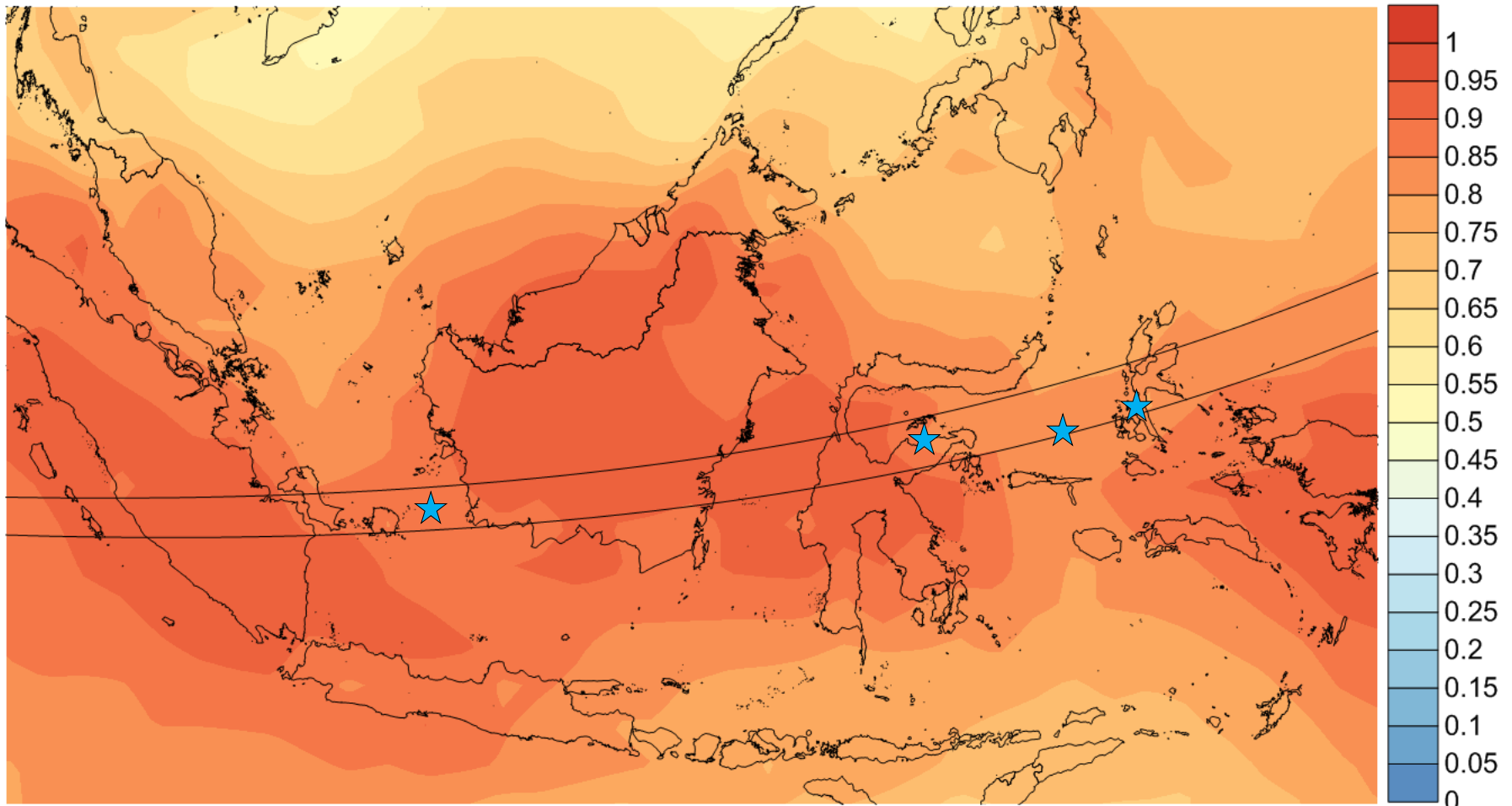




**Significant  
wave heights  
for March**

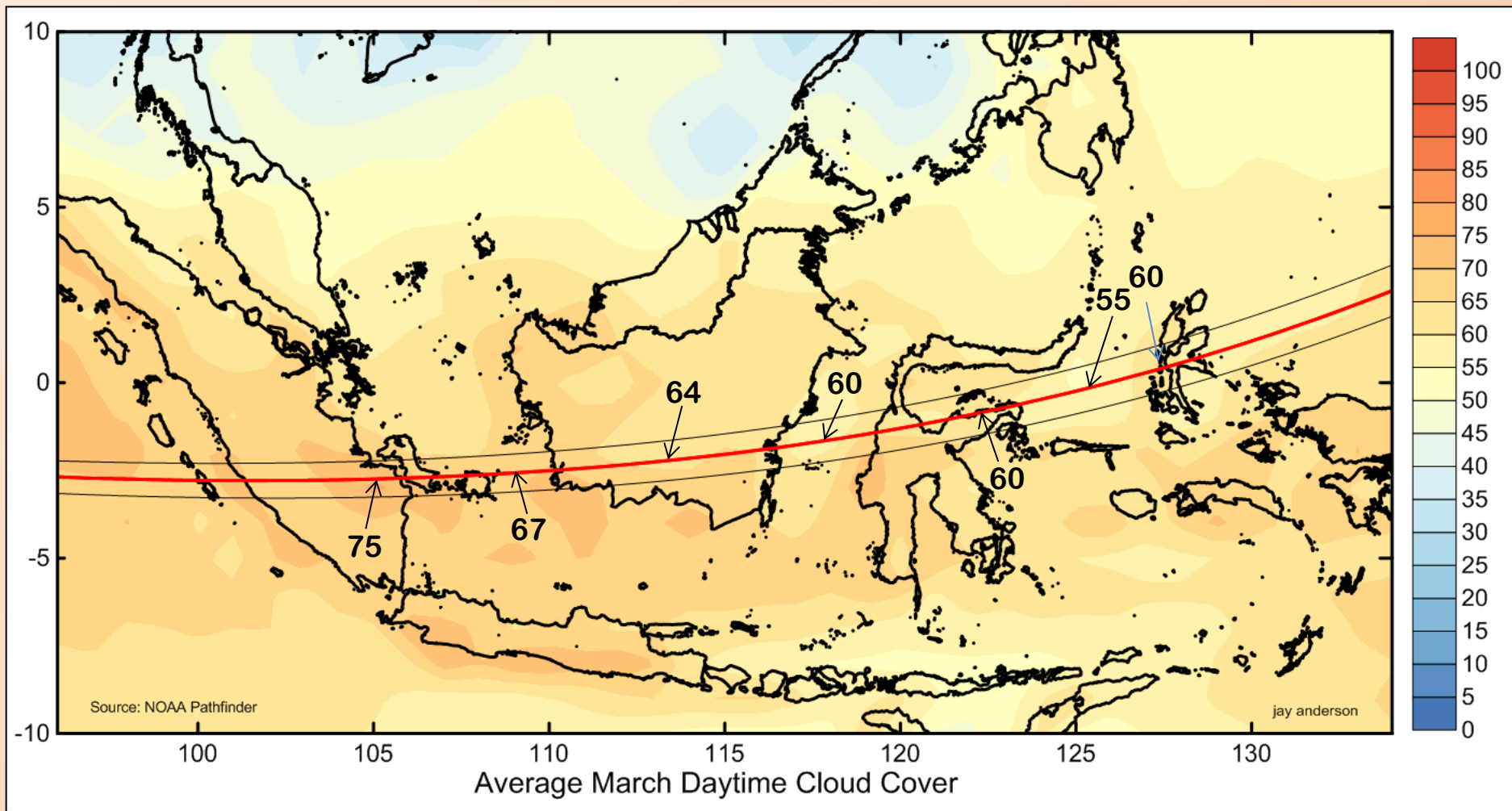


# 2016: Indonesia

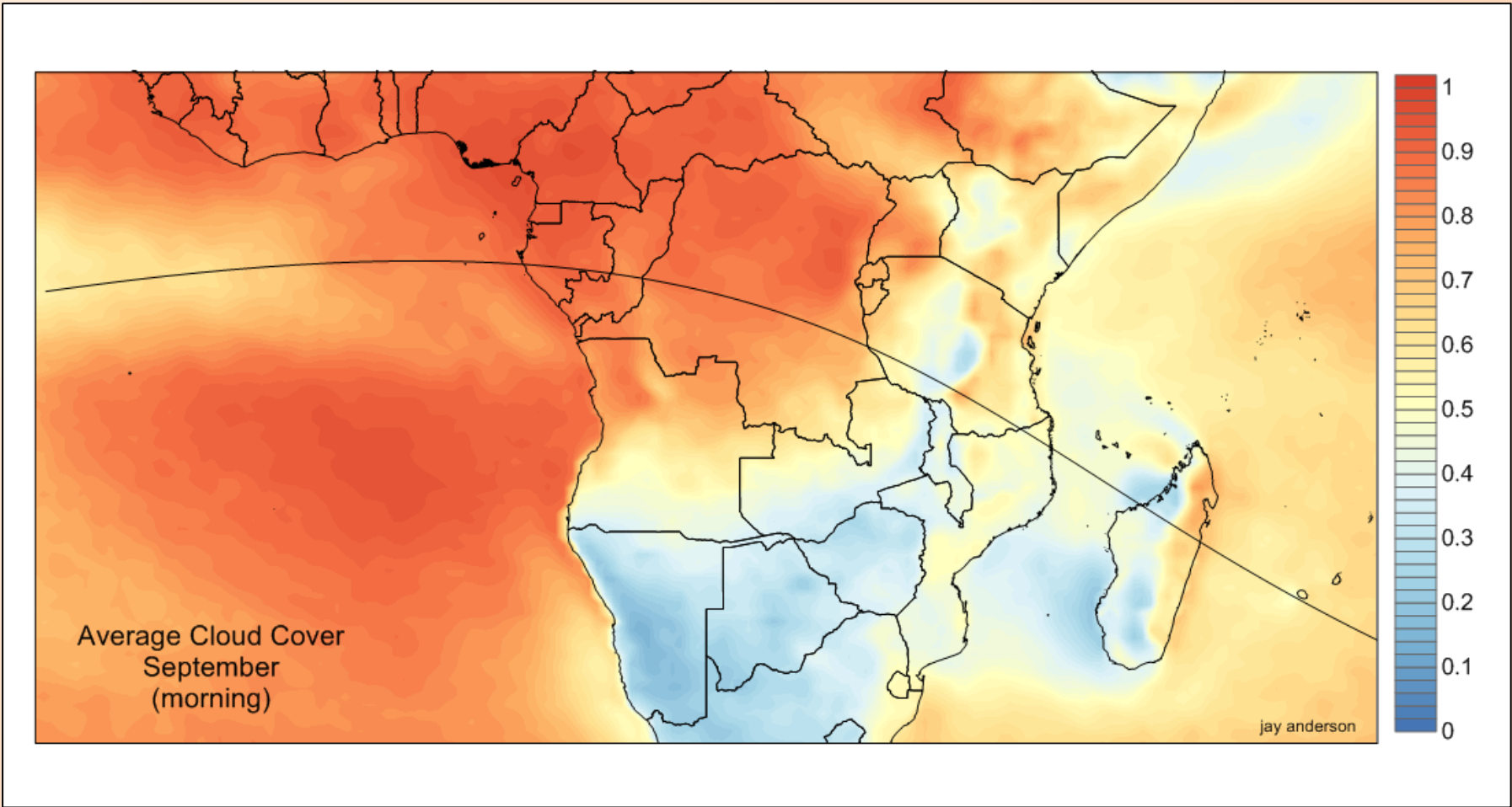


Average March Cloud Cover from Satellite  
7 am morning pass



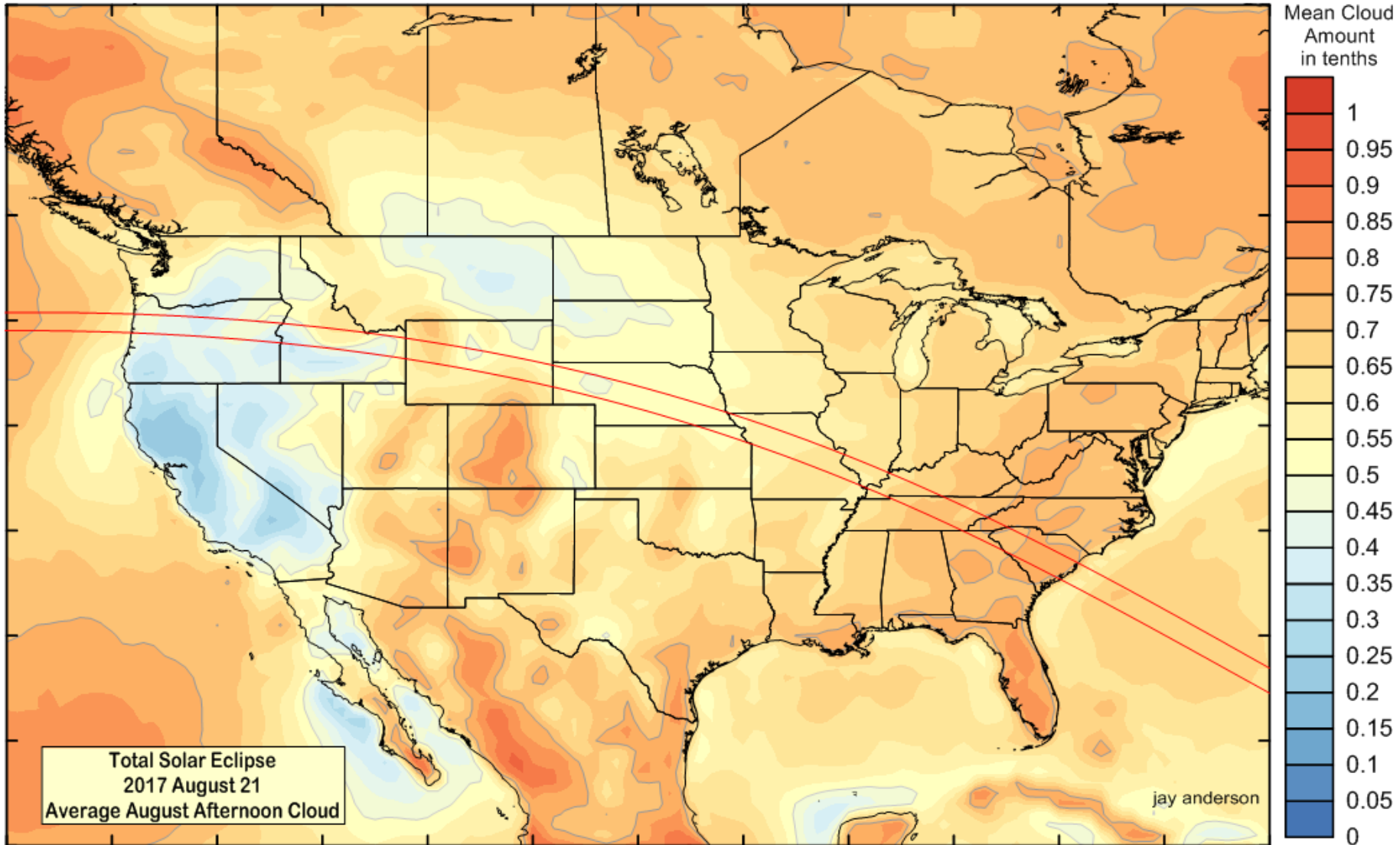


**Satellite-based cloud cover (older dataset)**



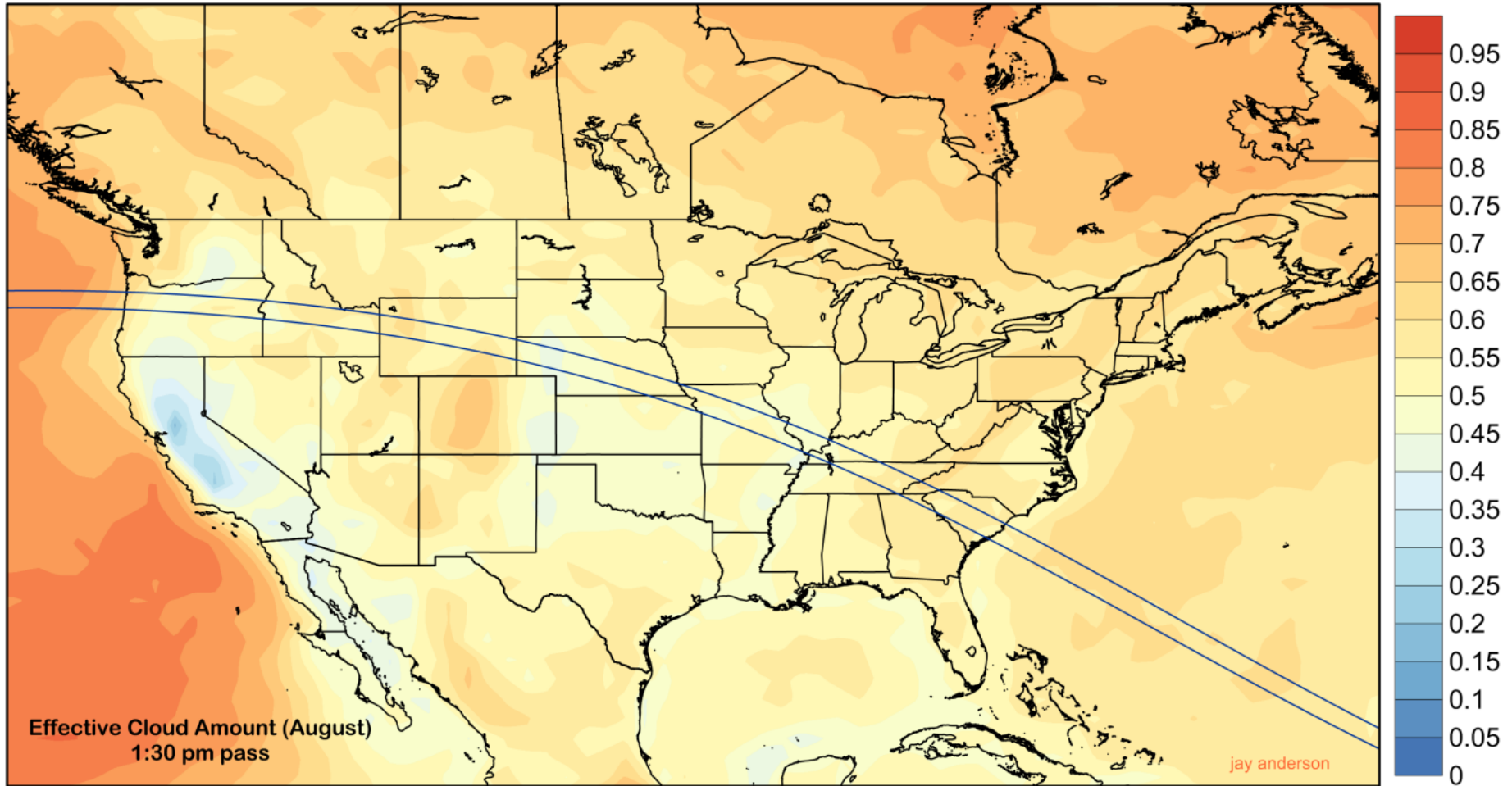
## 2016 September 1 Annular Eclipse

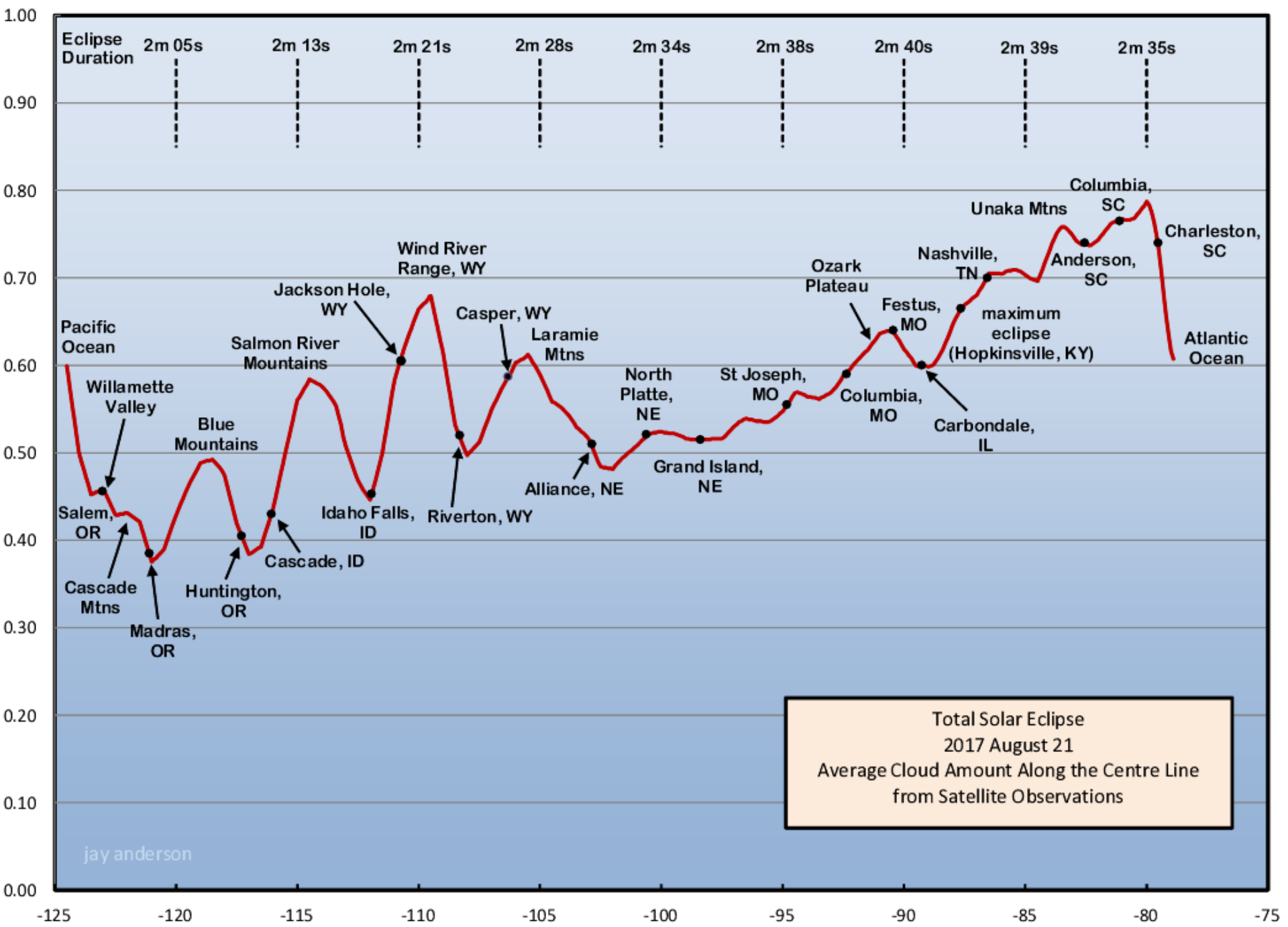
# August Cloud Amount





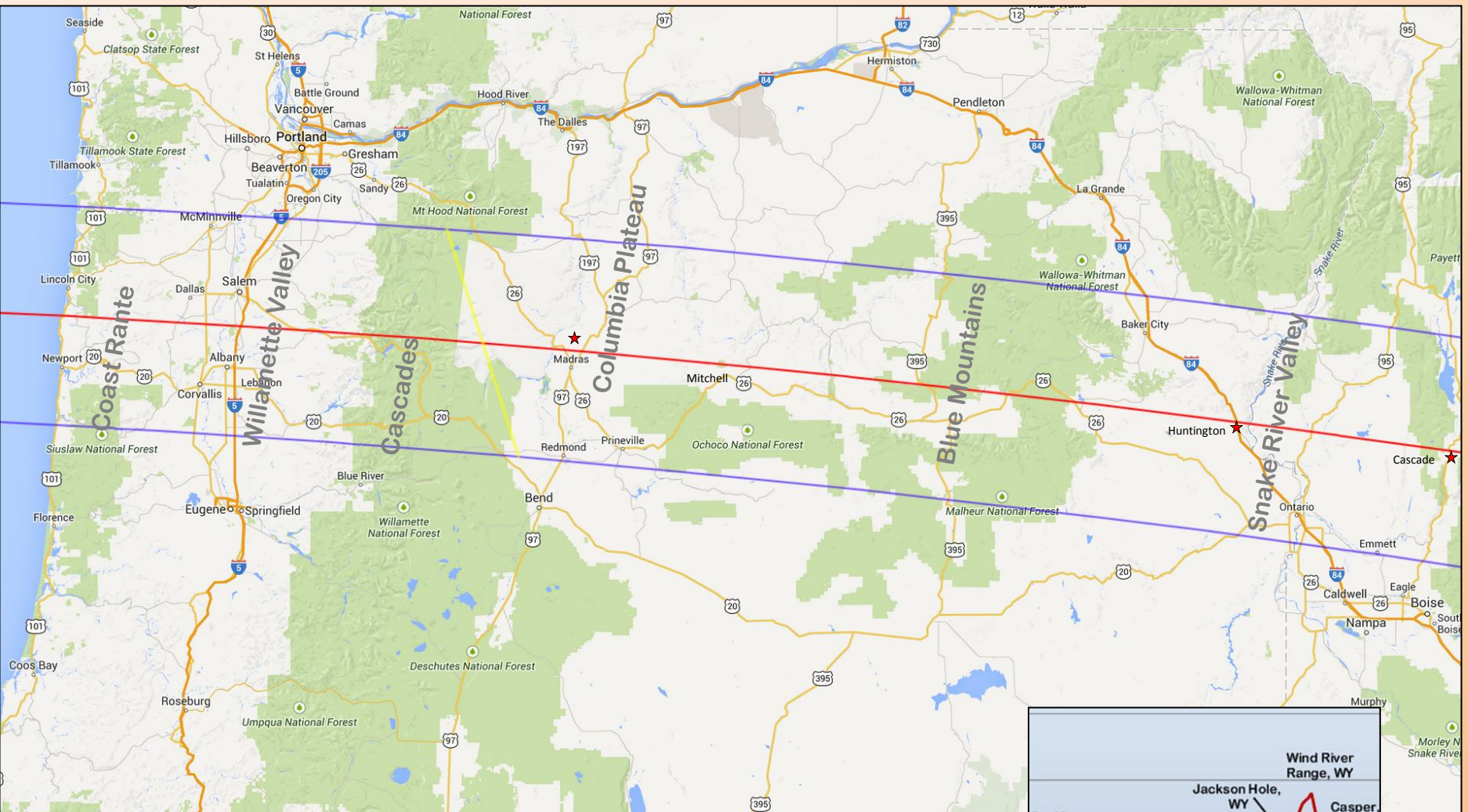
# August Effective Cloud Amount



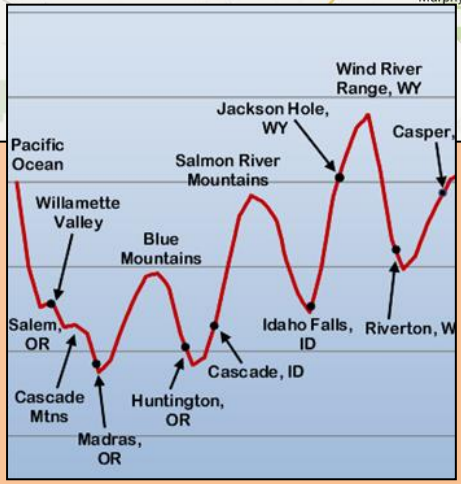


Total Solar Eclipse  
 2017 August 21  
 Average Cloud Amount Along the Centre Line  
 from Satellite Observations

jay anderson



# Oregon to Idaho





<b>Oregon</b>										
Newport Municipal	Newport		46.2	0.0	9.0	4.6	40.2	0.0	0.0	47.8
Sexton Summit	Grants Pass		85.4	4.5	3.1	2.1	1.4	3.5	0.0	8.6
Corvallis Muni	Corvallis		64.0	3.0	1.5	5.1	26.4	0.0	0.0	31.5
McMinnville Muni	McMinnville		62.0	2.0	3.9	6.3	25.9	0.0	0.0	32.8
McNary Field	Salem		52.1	5.2	11.0	13.2	18.6	0.0	0.0	34.5
Rogue Valley Airport	Medford		83.2	4.9	2.9	4.4	4.6	0.0	0.0	10.1
Klamath Falls Airport	Klamath Falls		52.7	22.3	13.3	10.7	1.0	0.0	0.0	18.7
Roberts Field	Redmond		92.8	2.5	1.0	1.4	2.4	0.0	0.0	4.3
Grant Regional Ogilvie	John Day / Canyon City		90.9	0.4	3.7	1.2	3.7	0.0	0.0	6.3
Baker Muni	Baker City		93.4	3.3	0.3	1.3	1.7	0.0	0.0	3.4
Ontario Muni	Ontario		94.4	2.3	2.3	0.7	0.3	0.0	0.0	2.2
<b>Idaho</b>										
Challis Arpt	Challis		76.6	9.7	2.6	7.1	4.1	0.0	0.0	12.3
Idaho Falls Regional	Idaho Falls, Amon, Shelley		66.0	6.6	12.5	10.1	4.9	0.0	0.0	19.3
Rexburg Madison County Arpt	Rexburg/Sugar City, Teton		89.2	4.4	2.7	2.4	1.4	0.0	0.0	5.1
Driggs Reed Memorial Arpt	Driggs/Reed		77.2	14.3	2.6	4.2	1.6	0.0	0.0	8.3
Pocatello Municipal	Pocatello	81	66.2	18.1	10.7	4.3	0.7	0.0	0.0	11.6
Friedman Memorial	Hailey		44.0	28.0	14.7	9.3	1.3	2.7	0.0	22.1
Boise Municipal	Boise	85	95.3	1.8	1.6	0.4	0.9	0.0	0.0	2.2
Lemhi County	Lemhi		75.2	9.5	5.7	3.1	6.5	0.0	0.0	12.9
<b>Wyoming</b>										
Jackson Hole Airport	Jackson Hole/Teton Village		69.7	9.7	11.8	8.0	0.8	0.0	0.0	13.7
Hunt Field Airport	Lander/Boulder Flats	75	85.2	5.2	3.2	3.0	3.4	0.0	0.0	8.0
Riverton Regional (20 yr)	Riverton		81.0	4.8	1.2	4.6	3.2	0.0	0.0	8.1
Natrona County	Casper		82.0	7.8	3.7	3.5	2.9	0.0	0.0	8.5
Converse County Arpt	Douglas		84.4	7.0	2.7	2.3	3.6	0.0	0.0	7.7
Torrington Muni	Torrington/Morrill/Lingle		83.4	3.1	1.7	4.4	7.4	0.0	0.0	12.1

A small digression:

For the most part, these observations are acquired by ceilometers with an upper range of 12,500 feet.

An observation of “clear” means “clear below 12,000”

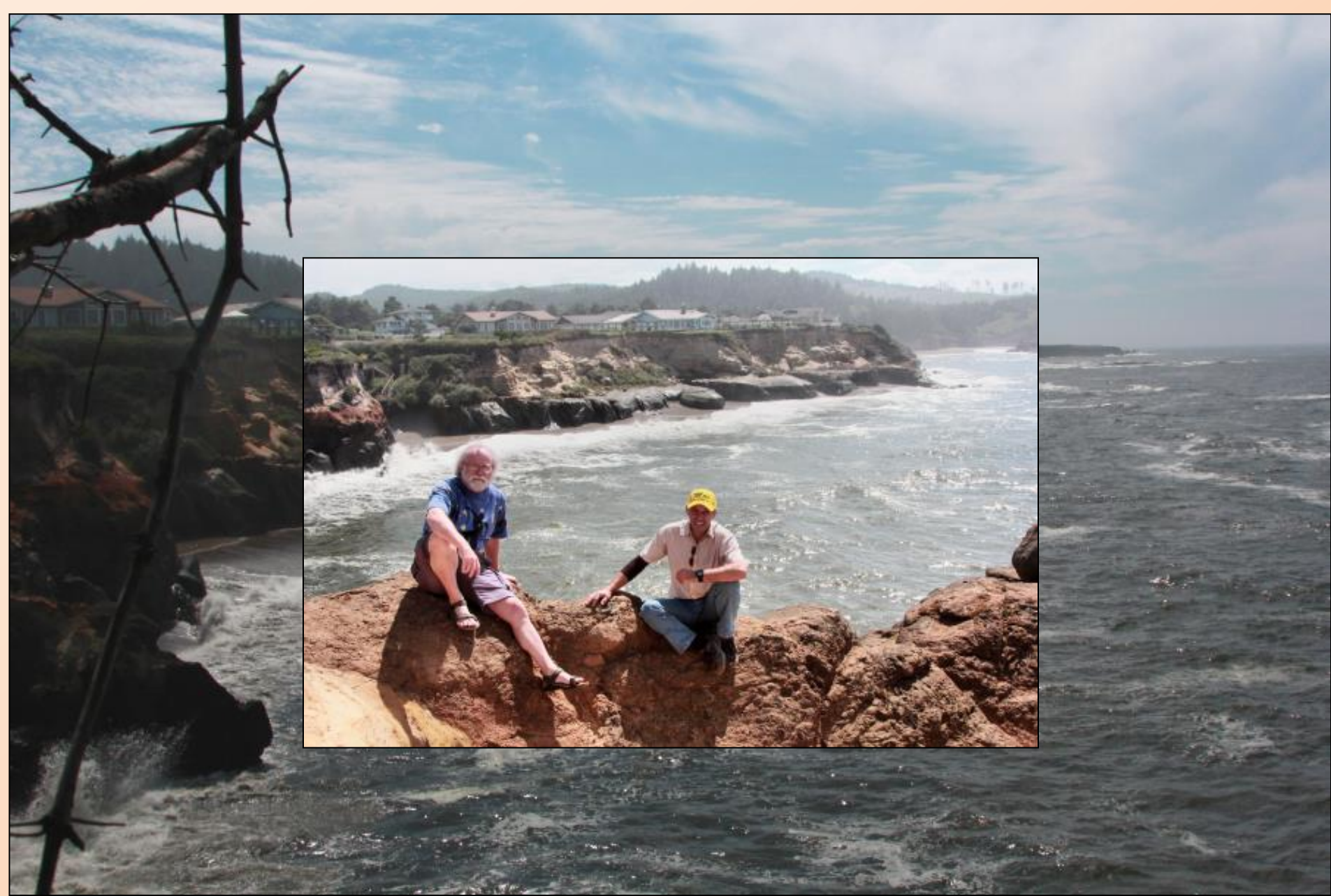
# Ceilometers

- Laser beam reflection
- 30-second sample
- 12,500-foot (3600 m) limit (in Canada, 25,000)
- After 2007, begin replacement with higher range ceilometers (over 900 to be replaced)
- Establishment began 1991, finished 2004
- All clouds assumed opaque
- Ceiling based on past 30 minutes of returns
- Pilots comment that ceilometers don't report enough cloud



“clear”





**At the beginning: Fishing Rock, Oregon**



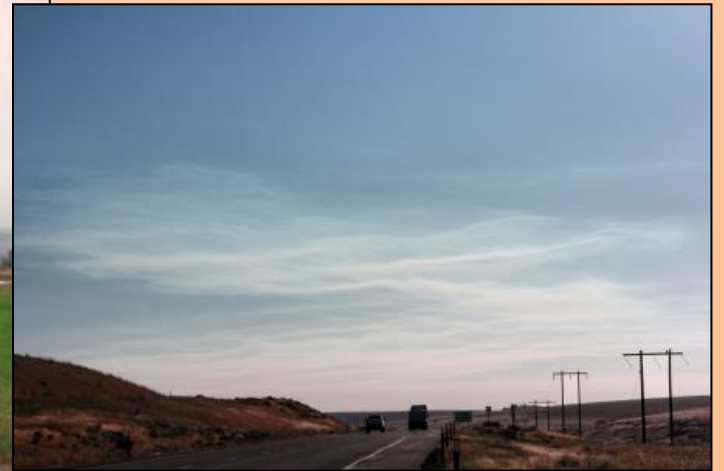
On the way to Madras



Madras, OR



Centreline north of Madras, OR



Forest fire smoke





**Entering the Blue Mountains, near John Day Fossil Beds National Park**



**Blue Mountains**

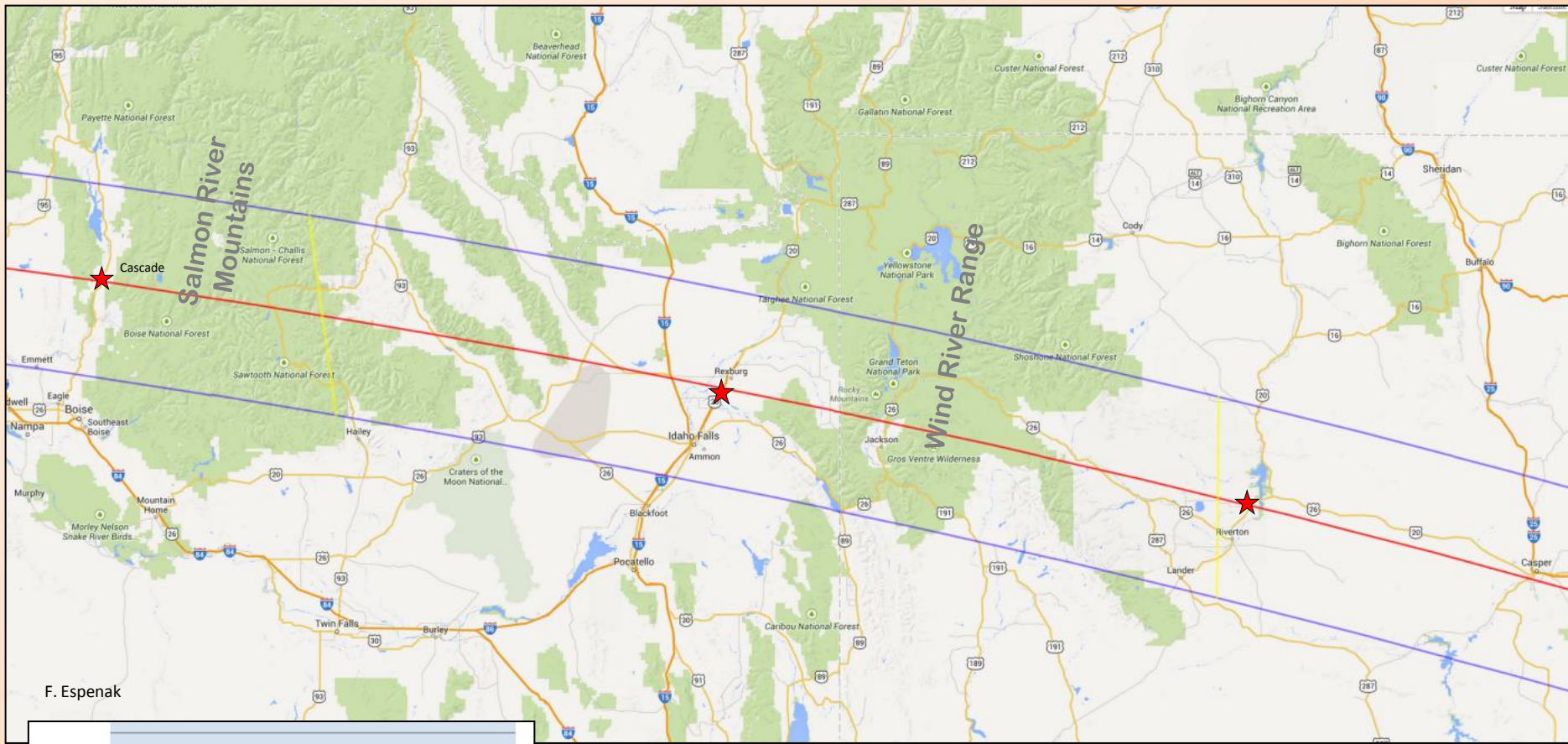


**Snake River country**



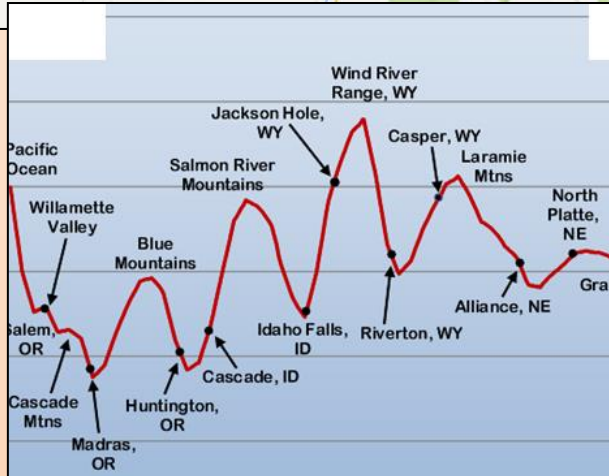


**Little Pine Cafe, Mitchell, OR**

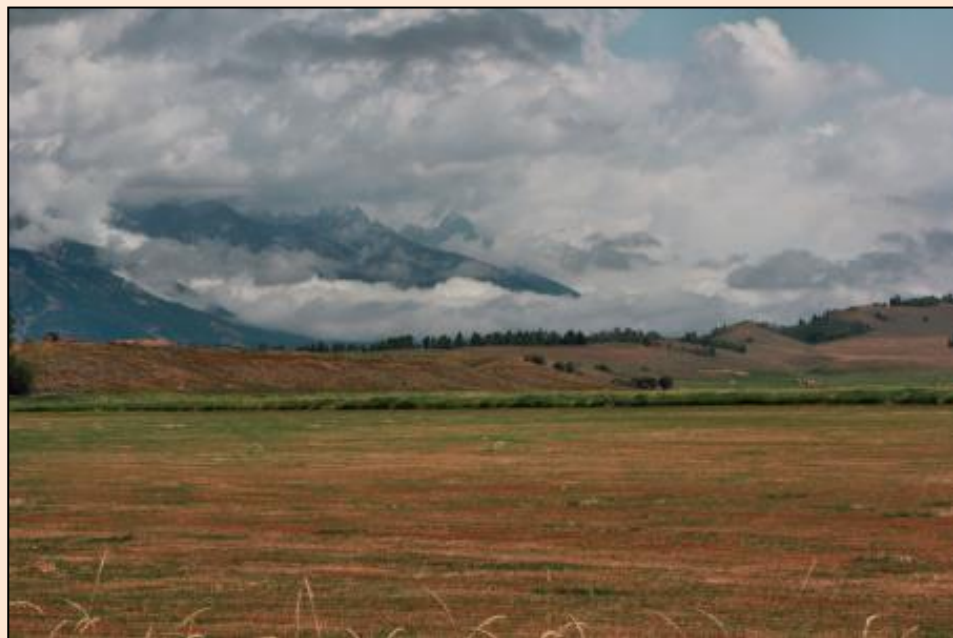


F. Eспенak

# Idaho to Wyoming







**Coming up on the Snake River Range (SE Idaho Falls)**



**View over Teton Village**



**The landscape above Teton Village (Jackson Hole), WY**



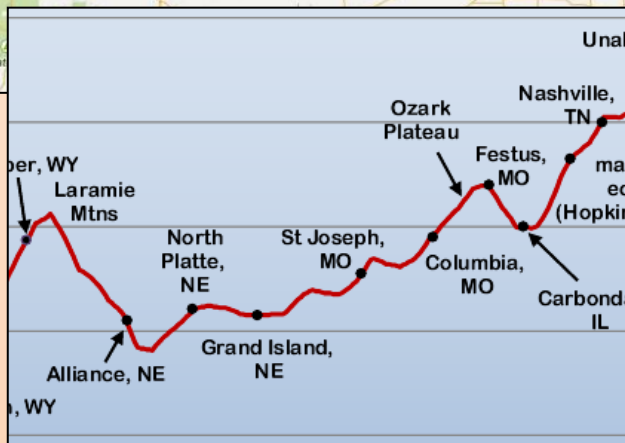
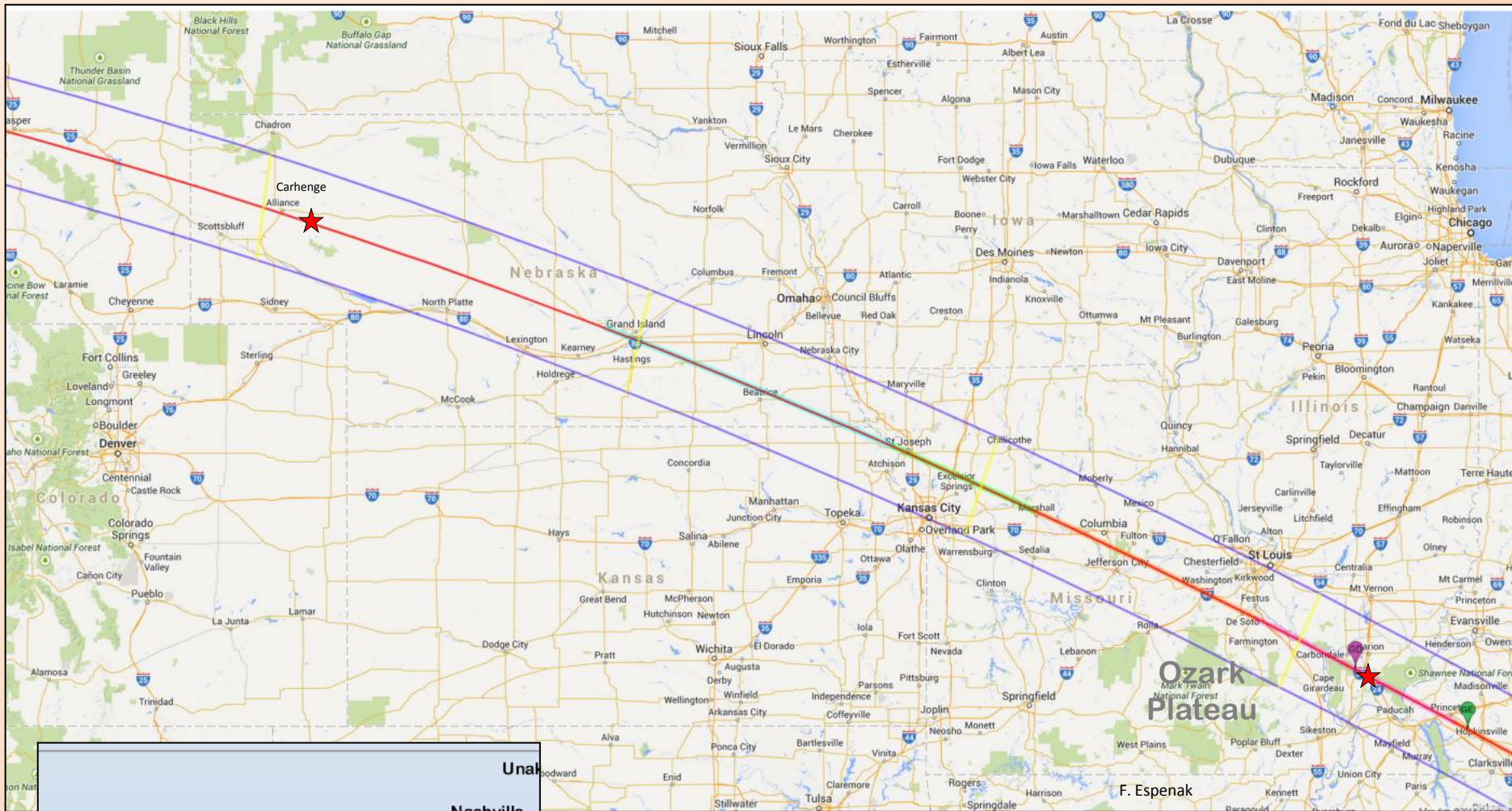


**High country outside of Casper**



**Fort Casper**





Casper, WY to Hopkinsville, IL





**Carhenge, near Alliance, NE**





**Rolling farmlands of Nebraska**



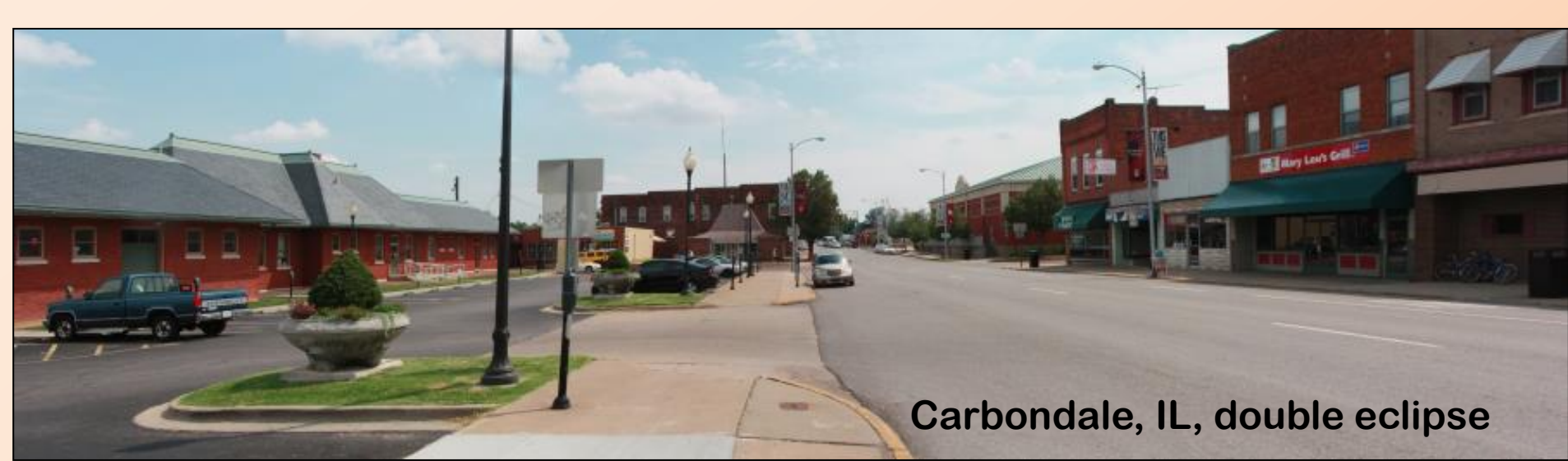
**Remington Nature Center, St Joseph**



**Mississippi centre line**



**Amish country, near Hopkinsville**



**Carbondale, IL, double eclipse**



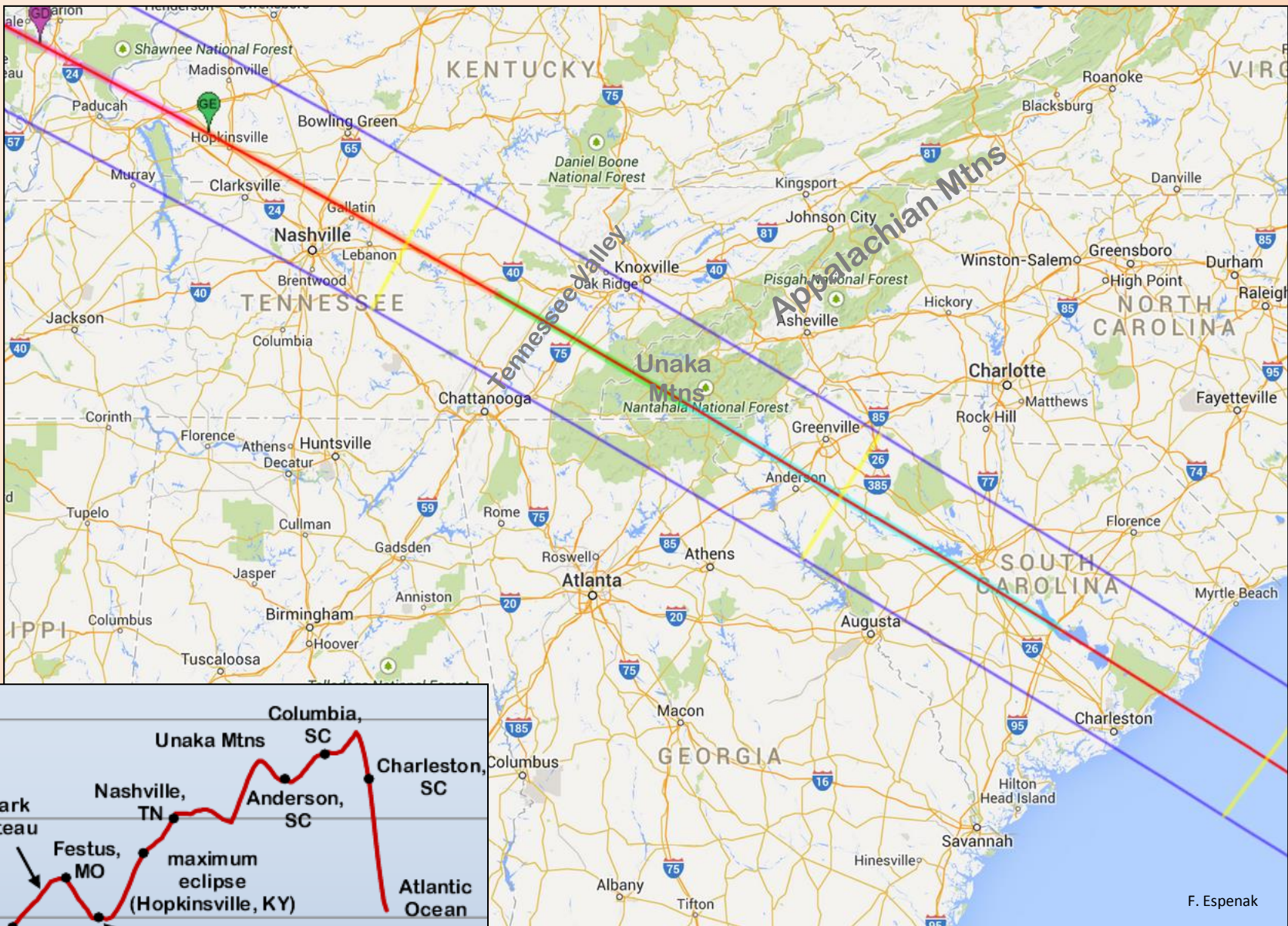
**Maximum eclipse, NE Hopkinsville**



<b>Nebraska</b>										
Western Nebraska Regional	Scottsbluff/Minatare		80.6	6.5	2.6	5.0	5.3	0.0	0.0	11.4
Alliance Muni	Alliance		78.2	3.0	4.4	7.0	7.4	0.0	0.0	15.3
Hooker County Airport	Mullen		21.9	32.1	0.0	20.1	25.6	0.2	0.0	46.5
North Platte Regional Arpt	North Platte	75	68.4	8.8	5.9	5.3	11.7	0.0	0.0	19.8
Broken Bow Muni	Broken Bow		69.3	6.2	7.0	9.3	8.2	0.0	0.0	19.5
Jim Kelly Field	Lexington		64.2	0.0	13.9	9.8	12.2	0.0	0.0	25.9
Kearney Regional Airport	Kearney/Gibbon		67.8	7.0	6.6	8.9	9.7	0.0	0.0	20.6
Hastings	Hastings		68.4	9.4	7.9	7.9	6.4	0.0	0.0	17.5
Central Nebraska Regional Arpt	Grand Island		61.0	9.6	8.4	10.9	10.1	0.0	0.0	23.8
Aurora Municipal Airport	Aurora		62.2	3.0	15.9	8.1	10.4	0.4	0.0	24.6
Lincoln Municipal	Lincoln	70	57.5	14.1	8.7	10.2	9.5	0.0	0.0	23.5
Beatrice Municipal	Beatrice		70.2	0.0	14.5	7.7	7.7	0.0	0.0	20.1
Columbus Muni	Columbus		59.5	9.1	10.7	9.9	10.7	0.0	0.0	24.5
Brenner Field Airport	Falls City		58.7	10.8	8.6	10.5	11.4	0.0	0.0	25.1
Sidney Municipal/ Lloyd W. Carr	Sidney		79.7	6.4	3.1	4.2	6.6	0.0	0.0	12.2
Chadron Municipal	Chadron		67.1	10.7	7.2	8.4	6.7	0.0	0.0	18.1
<b>Missouri</b>										
Rosecrans Arpt	St Joseph		67.8	11.5	5.0	8.4	7.3	0.0	0.0	17.8
Kansas City International	Kansas City/Platte	67	59.1	16.2	10.0	9.7	5.0	0.0	0.0	19.5
Sedalia Memorial	Sedalia		63.3	10.2	9.0	9.4	8.2	0.0	0.0	21.1
Columbia Regional	Columbia/Ashland	64	41.0	24.0	13.6	10.7	10.7	0.0	0.0	28.8
Jefferson City Mem	Jefferson City		59.1	16.2	10.0	9.7	5.0	0.0	0.0	19.5
Spirit of St Louis Airport	St Louis	65	30.0	12.3	25.1	20.6	11.9	0.0	0.0	40.9
St Louis International Apt	St Louis		5.5	16.2	28.5	36.2	13.7	0.0	0.0	57.0
Farmington Regional Arpt	Farmington/Park Hills		50.6	13.0	12.6	17.2	6.5	0.0	0.0	27.5
Cape Girardeau Muni	Cape Girardeau/Jackson		61.7	15.3	9.1	8.3	5.8	0.0	0.0	18.5
Lee C. Fine Airport	Brumley		55.2	14.3	13.5	10.0	7.0	0.0	0.0	23.0
<b>Illinois</b>										
St Louis Downtown Apt/Cahokia	St Louis		65.7	9.7	9.7	8.5	6.4	0.0	0.0	18.8
Southern Illinois	De Soto/Murphysboro		55.7	19.4	13.1	8.9	3.0	0.0	0.0	18.7
Williamson County Regional	Marion/Herrin/Carterville		21.0	4.3	33.3	29.7	11.6	0.0	0.0	50.0
Scott AFB/MidAmerica	Scott AFB/Shilo		26.4	24.2	15.2	23.5	10.8	0.0	0.0	39.6

## Surface Observations of Cloud Cover, 1995-2014



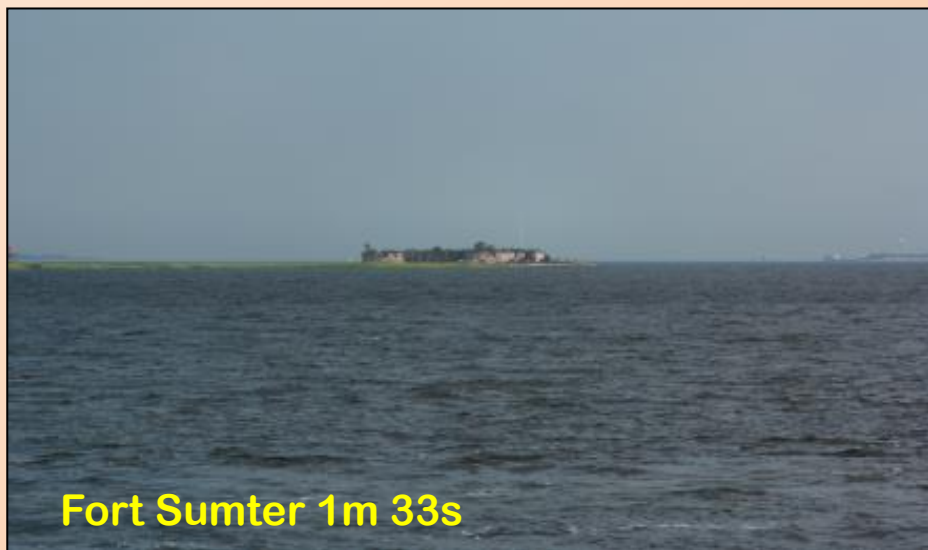


**Carbondale, IL to Charleston, SC**





**Atlantic coast, south of the central line**



**Fort Sumter 1m 33s**



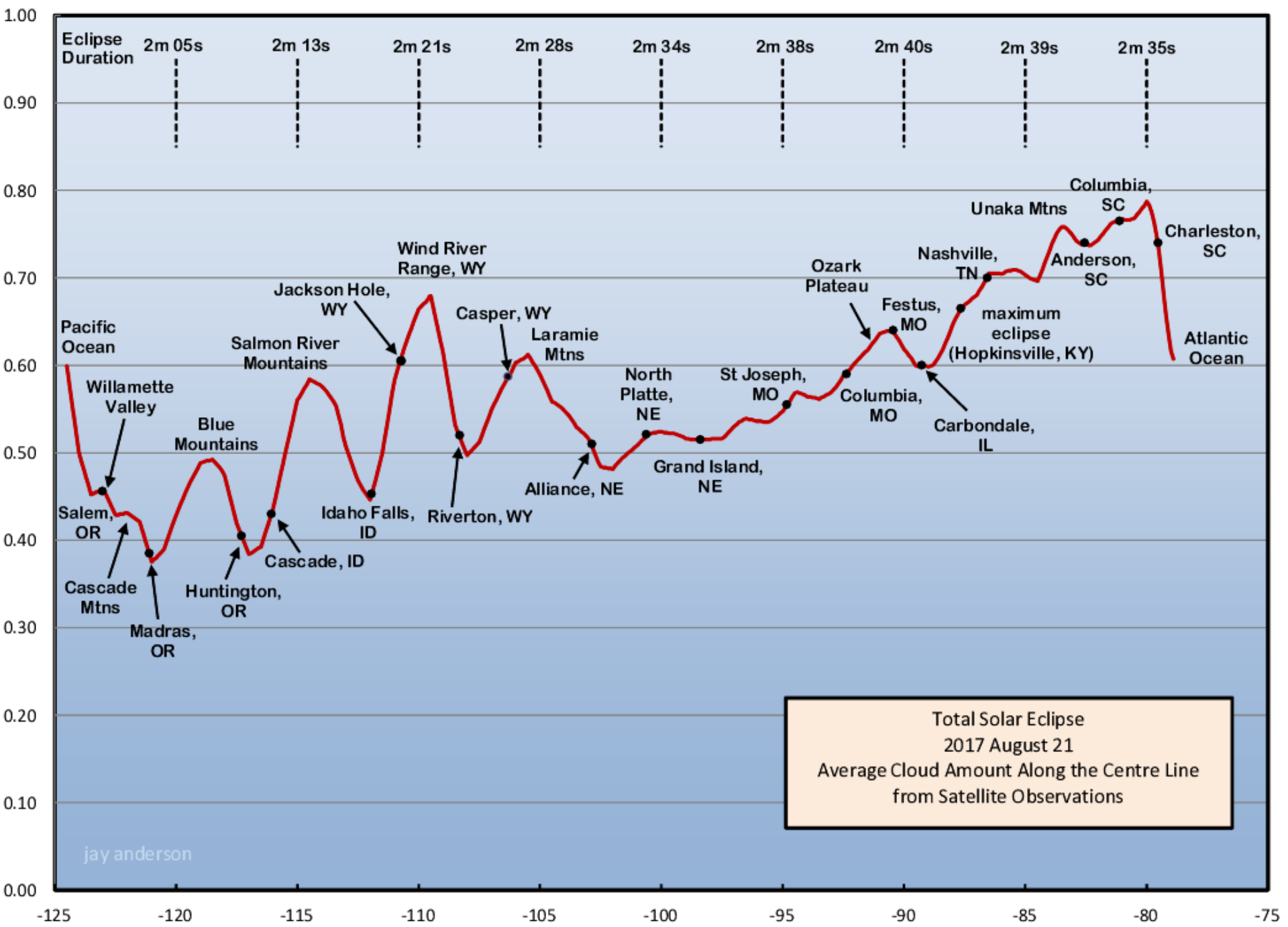
**Coast road to the central line**



<b>Kentucky</b>										
Barkley Regional Airport	Paducah	71	55.5	14.5	10.7	13.1	5.8	0.4	0.0	23.4
Bowling Green/Warren County	Bowling Green		51.9	16.2	9.8	16.9	5.3	0.0	0.0	25.3
Owensboro-Daviess County	Owensboro		42.2	15.2	24.9	14.3	3.4	0.0	0.0	27.8
<b>Tennessee</b>										
Nashville International Arpt	Nashville	63	1.8	7.5	36.9	45.2	8.6	0.0	0.0	61.2
Smyrna Arpt	Smyrna		17.9	29.2	30.8	17.9	4.2	0.0	0.0	36.2
Chattanooga Metropolitan Arpt	Chattanooga	63	7.9	23.7	37.2	24.8	6.4	0.0	0.0	45.8
<b>North Carolina</b>										
Asheville Municipal	Asheville		47.9	0.0	41.4	7.1	3.6	0.0	0.0	27.3
<b>South Carolina</b>										
Anderson County	Anderson		44.8	15.0	14.3	15.8	10.2	0.0	0.0	31.0
Greenville Spartanburg	Greenville	61	28.7	23.9	15.0	24.4	8.0	0.0	0.0	37.4
Columbia Metro	Columbia	66	2.3	8.3	37.7	42.7	8.9	0.0	0.0	60.1
Charleston AFB/International	Charleston	64	3.0	15.4	47.6	25.8	8.1	0.0	0.0	51.5
Beaufort MCAS	Beaufort		8.8	9.2	28.3	43.4	10.4	0.0	0.0	58.1

**Percent  
Of Possible  
Sunshine**

**Surface Observations of Cloud Cover, 1995-2014**



Total Solar Eclipse  
 2017 August 21  
 Average Cloud Amount Along the Centre Line  
 from Satellite Observations

jay anderson





## My thanks to

Fred Espenak for his eclipse tracks and circumstances  
Xavier Jubier for his eclipse tracks and circumstances  
TravelQuest (Aram) for including me in his scouting trips  
Stan Runge for sharing the driving across America  
NCDC for storing all of the climate data  
Patrick and Joanne for organizing this event, once again