

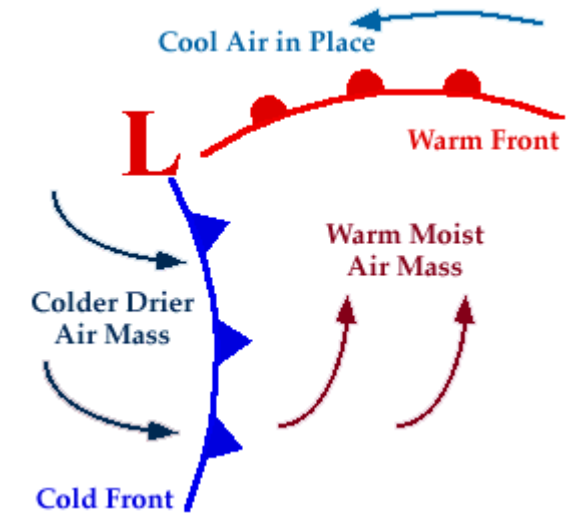
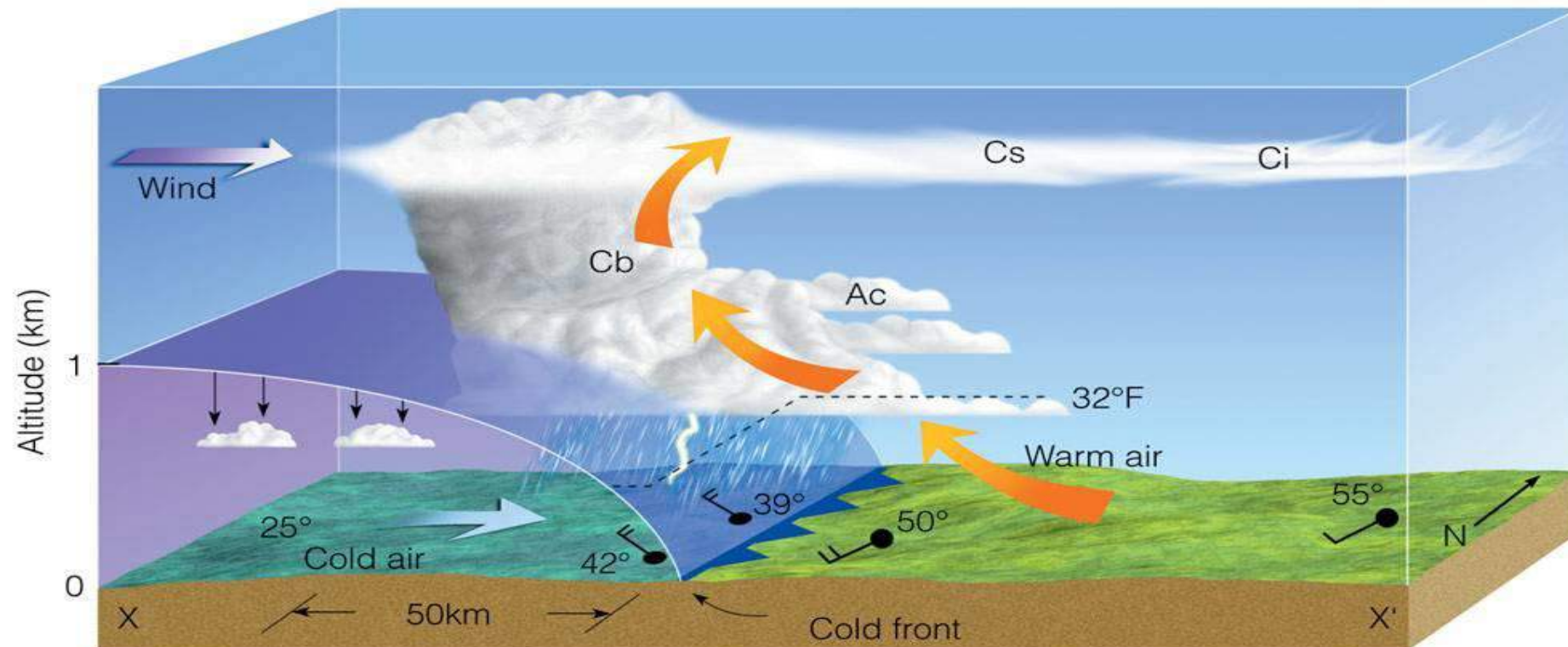
Stratocumulus clouds & cold front at Seattle

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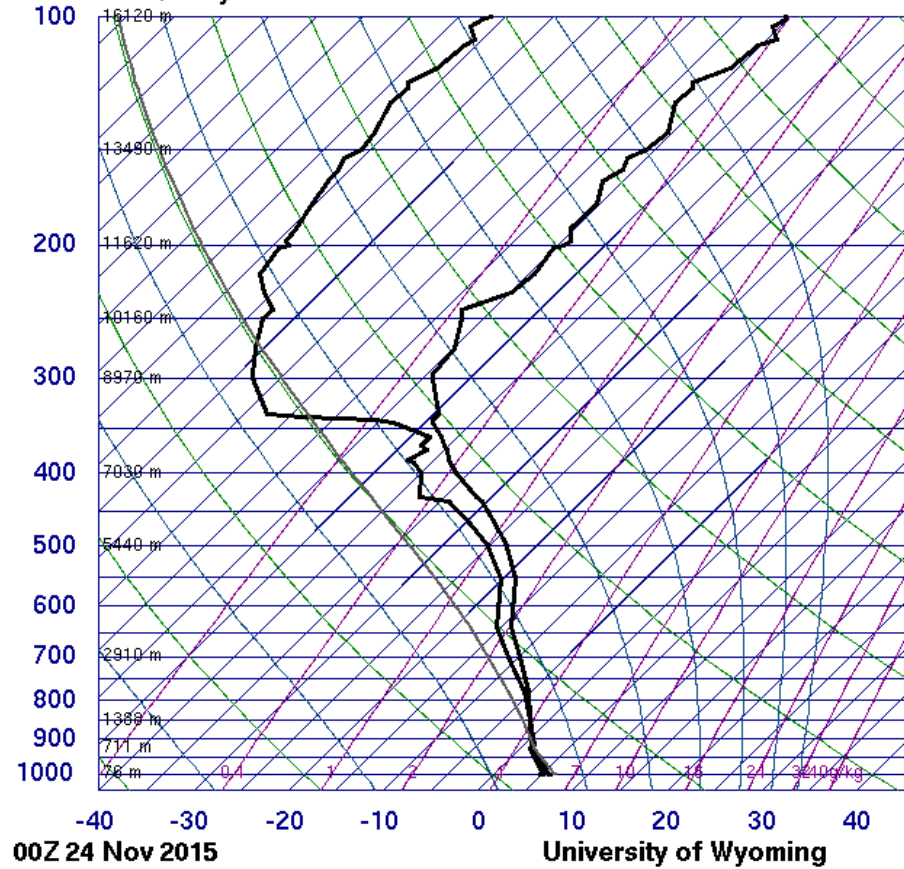
Cold front

- A cold front is defined as the transition zone where a cold air mass is replacing a warmer air mass. Cold fronts generally move from northwest to southeast in the northern hemisphere.



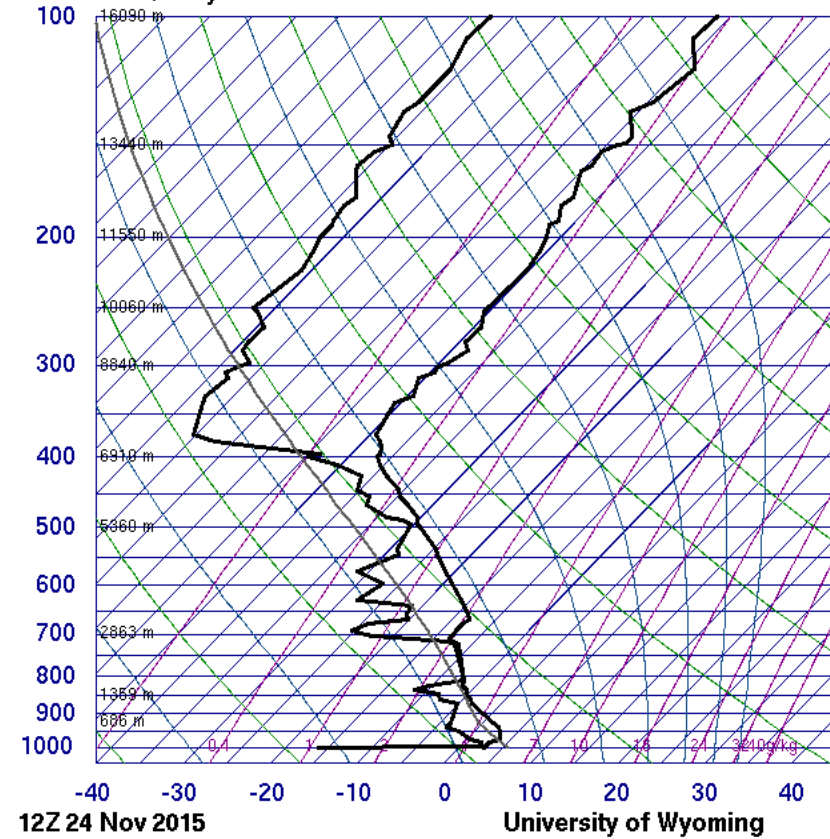
Sounding on 24th Nov 2015

72797 UIL Quillayute



SLAT	47.95
SLOE	-124.55
SELV	62.00
SHOW	9.16
LIFT	10.25
LFTV	10.34
SWET	67.00
KINX	18.00
CTOT	21.10
VTOT	21.20
TOTL	42.30
CAPE	0.19
CAPV	0.32
CINS	-0.02
CINV	0.00
EQLV	918.8
EQTV	917.8
LFCT	938.4
LFCV	940.7
BRCH	0.00
BRCV	0.01
LCLT	276.6
LCLP	963.6
MLTH	279.6
MLMR	5.14
THCK	5364.
PWAT	16.10

72797 UIL Quillayute



SLAT	47.95
SLOE	-124.55
SELV	62.00
SHOW	8.71
LIFT	7.61
LFTV	7.66
SWET	52.99
KINX	5.90
CTOT	20.80
VTOT	24.00
TOTL	44.80
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	272.1
LCLP	919.3
MLTH	278.7
MLMR	3.91
THCK	5298.
PWAT	10.46

Drop size distribution

Radii (microns)	Cloud concentration (no/cc)
7	660
21	550
27.5	300
34	150
37.5	30
42.5	7
45	1

Total number of concentration – 1698cm^{-3}

Mean radius – $18.24\mu\text{m}$

Liquid water mixing ratio – 1.274g/kg of air

Equivalent radius – $26.86\mu\text{m}$

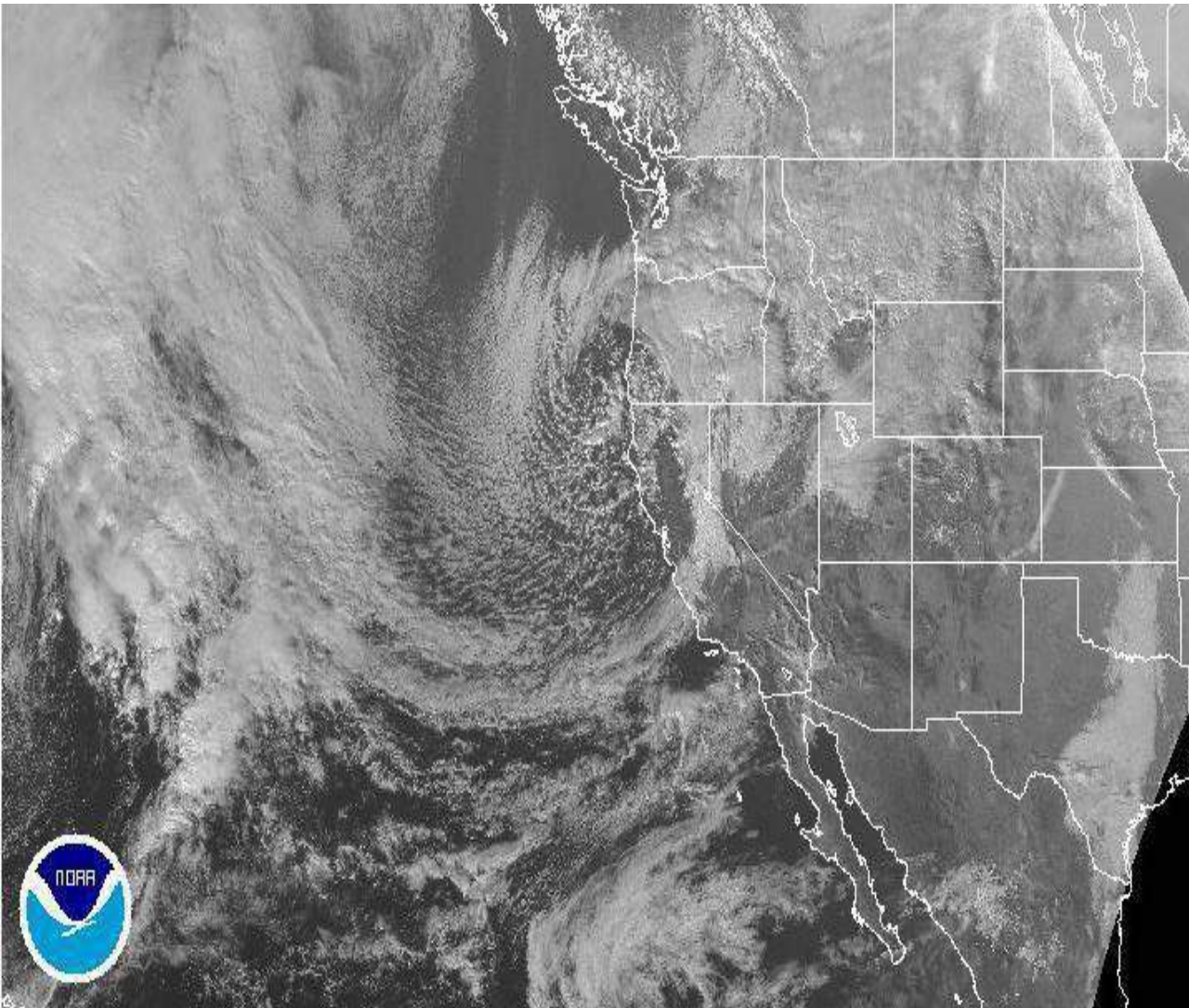
Extinction cross section – 1.464m^{-1}

Liquid water path – 1.8kg/m^2

Cloud optical depth – 184

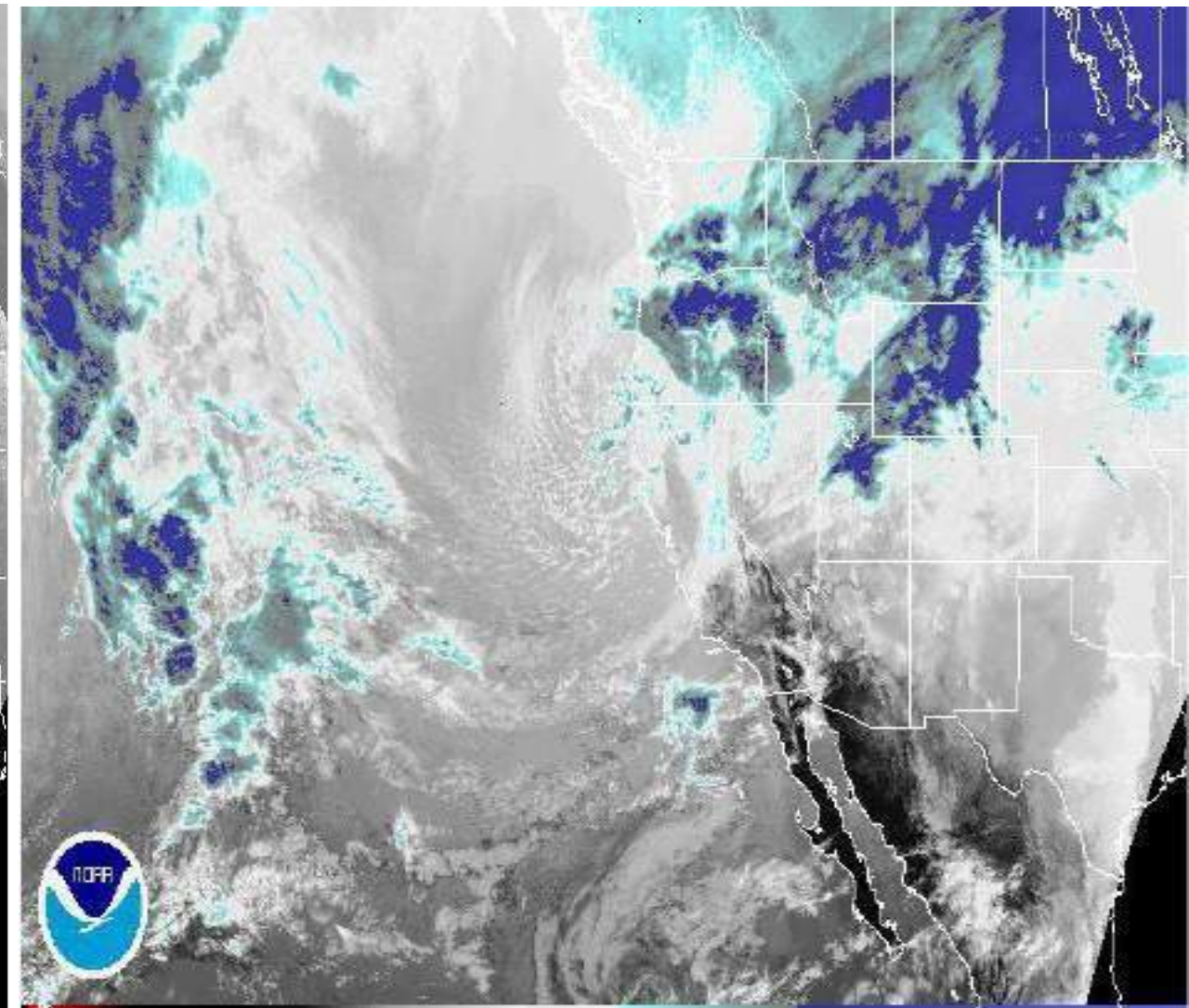
The liquid water content (LWC) is expected to be $0.25\text{-}0.3\text{g/m}^3$, at Seattle. LWC at the southern Washington is expected to be 1g/m^3 , assuming dissipative cumulonimbus clouds.

Satellite Images



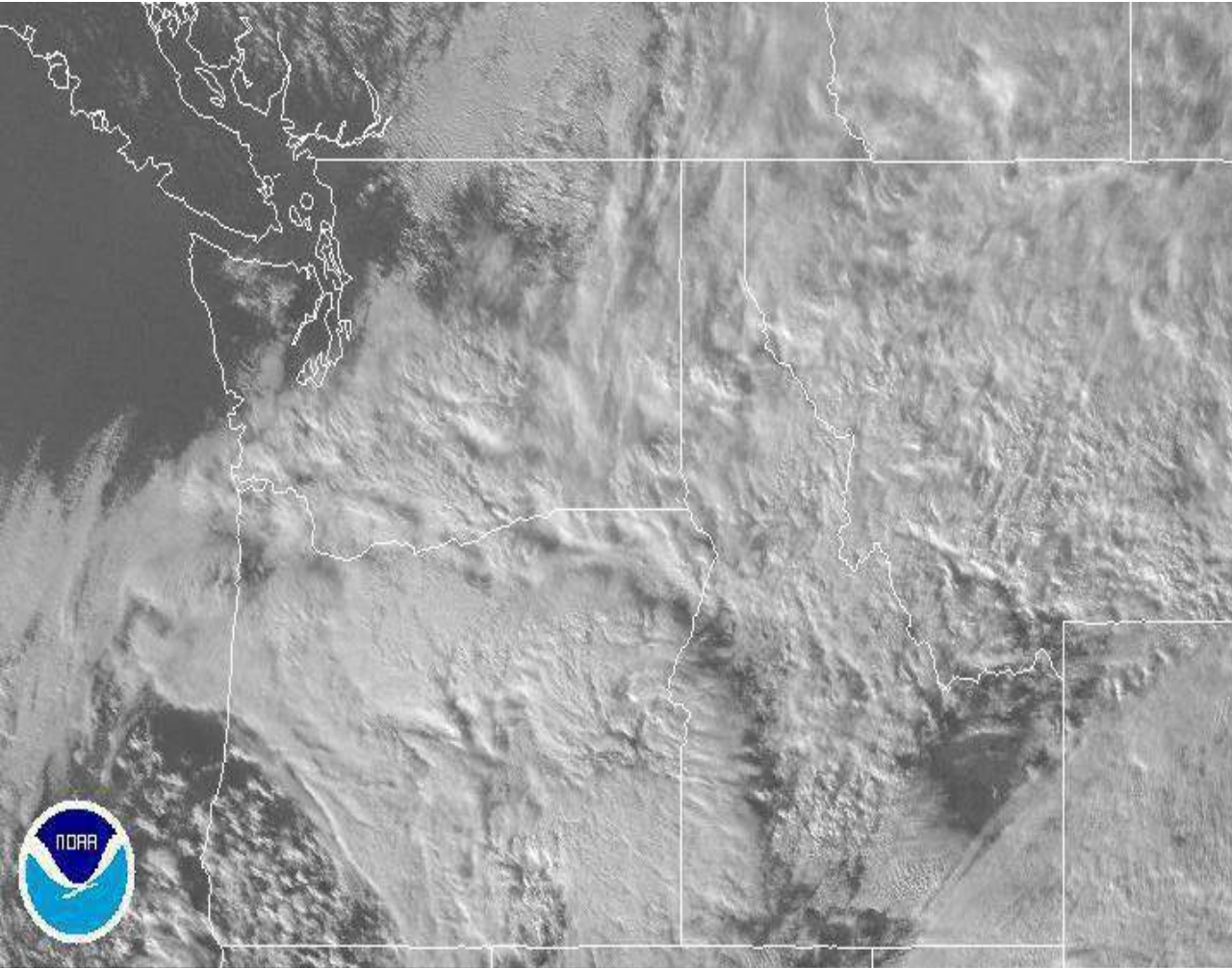
1 GOES-WEST VISIBLE - NOV 24 15 22:30 UTC

McIDAS



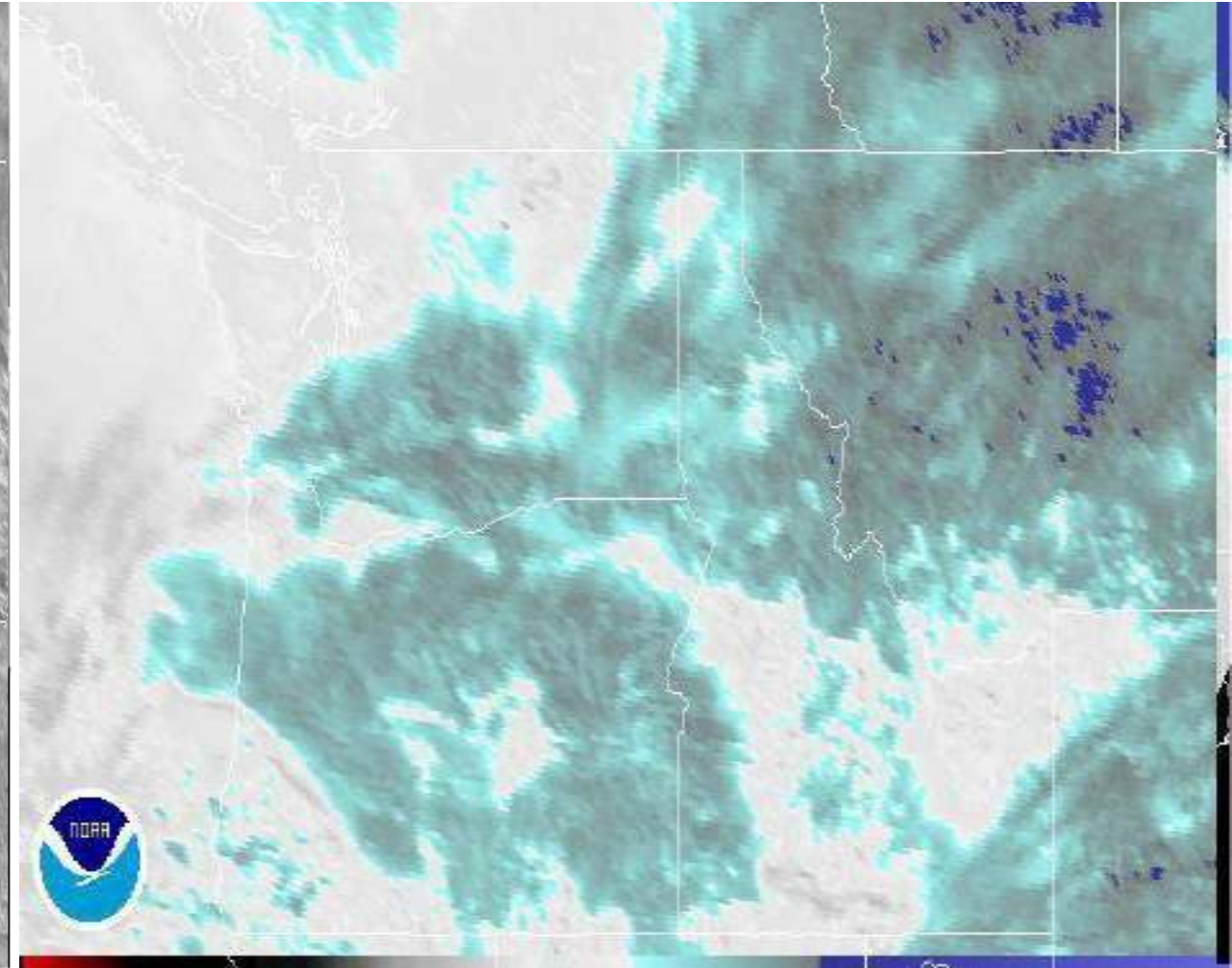
2 GOES-WEST IR CH. 2 - NOV 24 15 23:00 UTC

Satellite Images



GOES-EAST VISIBLE - NOV 24 15 22:45 UTC

NOAA



GOES-EAST IR CH. 2 - NOV 24 15 22:45 UTC

2

Rainfall rate

$$R = \frac{\pi}{6} \sum n d^3 V \text{ Westbrook et al (2010)}$$

$$V = 6.0558d^3 - 93.065d^2 + 500.84d - 21.576 \text{ (Ken Takahashi)}$$

Assumption

- Raindrop size is 100 times the cloud drop size
- Number of raindrop is 100 times lesser than the number of cloud drop.

Cloud event

- Predicted rainfall rate – 4.93mm/hr(terminal velocity calculated from Ken Takahashi)
- Predicted rainfall rate – 1.88mm/hr(terminal velocity calculated from stokes regime i.e., drag force of the raindrop is proportional to radius square)
- Reported precipitation rate – 7.1mm(0.28in) from 12:00am to 05:00pm on 24th Nov, which implies the precipitation rate is anywhere in between 0.418mm/hr to 7.1mm/hr

References

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