# Snow/Liquid Ratio

The snow/liquid ratio (SLR) is computed using the 2011 Cobb-Waldsteicher method.[1] We compute the SLR for each member of the SREF by looking at the debiased sounding[2] for layers with sufficient moisture (>90% RH with respect to ice) and rising vertical motion (negative omega). If these conditions are met for at least 11 of the 21 SREF members, then we will produce a probabilistic SLR forecast.

The spread of the probabilistic SLR forecast is calculated from the standard deviation of the SLR member forecasts. Box-and-whisker plots are then generated from these probabilities.

SLR can be computed regardless of whether or not it is cold enough to snow. As a result, it can produce some unrealistic values. We constrain the SLR for each ensemble member to be no more than 30-to-1.

Once the standard deviation is used to create the probabilistic SLR, some probability levels can be less than zero. We set any probabilistic SLR values that are less than one to one.

## References


Cobb, D.K., and J. S. Waldstreicher, 2005: A simple physically based snowfall algorithm. Preprints, *21st Conf. on Weather Analysis and Forecasting/17th Conf. on Numerical Weather Prediction,* Washington, DC, *Amer. Meteor. Soc.,* 2A.2. [Available online at http://ams.confex.com/ams/pdfpapers/94815.pdf]

Cobb, Daniel K. "A Simple Physically Based Snowfall Algorithm". [Available online at http://www.crh.noaa.gov/Image/eax/science/Snow_liquid_ratio.ppt]


## Footnotes

1. The only differences between the 2005 version and the 2011 version of the Cobb-Waldstreicher method are the layer snow ratio values used.

2005 Method:
LT(1) = -300: LSR(1) = 10
LT(2) = -22: LSR(2) = 10
LT(3) = -20: LSR(3) = 15
LT(4) = -17: LSR(4) = 45
LT(5) = -16: LSR(5) = 50
LT(6) = -15: LSR(6) = 45
LT(7) = -11: LSR(7) = 10
LT(8) = -10: LSR(8) = 7
LT(9) = -9: LSR(9) = 6.5
LT(10) = -5: LSR(10) = 7.5
LT(11) = 0: LSR(11) = 3
LT(12) = 1: LSR(12) = 0

LT(13) = 300: LSR(13) = 0

2011 Method:
LT(1) = -300: LSR(1) = 7.2
LT(2) = -30: LSR(2) = 7.2
LT(3) = -28: LSR(3) = 6.8
LT(4) = -26: LSR(4) = 7
LT(5) = -24: LSR(5) = 8.8
LT(6) = -22: LSR(6) = 12
LT(7) = -20: LSR(7) = 18
LT(8) = -18: LSR(8) = 23
LT(9) = -16: LSR(9) = 26
LT(10) = -14: LSR(10) = 22.5
LT(11) = -12: LSR(11) = 17.5
LT(12) = -10: LSR(12) = 12
LT(13) = -8: LSR(13) = 9.5
LT(14) = -6: LSR(14) = 9
LT(15) = -4: LSR(15) = 8.5
LT(16) = -2: LSR(16) = 7
LT(17) = 0: LSR(17) = 3
LT(18) = 1: LSR(18) = 0
LT(19) = 300: LSR(19) = 0

2. The debiased soundings are produced by debiasing and assigning BMA weights to a handful of common levels (200mb, 300mb, 500mb, 700mb, 850mb, 925mb, and 1000mb) for temperature, dewpoint, height, and vertical velocity. We then interpolate the biases and weights to every 25mb. This is done to ensure consistency between levels and to speed up the run time to ensure a timely product delivery.