Satellite Data Selection
- Enormous volumes of satellite data arrive at NWP centers in real-time
- Thinning is needed for efficiency
- Current practice is decimation (every nth data point)

Wavelet-based data selection
- Analyze two-dimensional scalar field using the Continuous Wavelet Transform (CWT).
- Identify wavelet transform modulus maxima (WTMM, c) for each scale using the wavelet magnitude (a) and phase (b).
- Create wavelet maxima chains from the WTMM for each scale by comparing nearest neighbors.
- Perform wavelet noise reduction to eliminate extraneous WTMM chains (d).
- Connect remaining wavelet maxima chains through scales to create wavelet ridge (signal skeleton).
- Select data points along wavelet ridge lines

Wavelet noise thresholding
- Calculate square modulus from wavelet components for each scale:
  \[ M_j [m, n] = |\psi_j [m, n]|^2 \]
- Model squared modulus as two-component Gamma distribution using Nelder-Mead simplex method:
  \[ p_{\psi_j} (x) = w_0 \frac{1}{\lambda_0} e^{-x/\lambda_0} + w_1 \frac{1}{\lambda_1} e^{-x/\lambda_1} \]
- Calculate posterior probability that wavelet coefficient is significant using Bayes Method.

Evaluation of thinning techniques

Summary:
- Wavelet analysis identifies meteorological features
- Atmospheric analysis of wavelet-selected points does not yet deliver gains in accuracy or efficiency
- Alternative basis functions or data assimilation methodologies will be explored

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