Two-component horizontal wind vectors from the Raman-shifted Eye-safe Aerosol Lidar (REAL)
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1. Relevance to Wind Energy
Wind resource assessment and very short-term predictions of the wind are likely to be of value in the development and production of wind energy.

2. Instrument
The Raman-shifted Eye-safe Aerosol Lidars (REALs) are elastic backscatter lidars designed to make time-lapse imagery of the clear atmosphere through aerosol scattering.

By applying motion estimation algorithms to the aerosol backscatter images, two component vector wind fields can be measured. Detection of the Doppler frequency shift is not required.

3. Experiment: CHATS
The original REAL was deployed for 3 months of nearly-continuous operation in 2007 in Dixon, CA. A 30 m tall instrumented tower was located at 1.61 km range. Independent measurements of the wind were made by sonic anemometers at multiple altitudes on the tower.

4. Data
More than 180,000 nearly-horizontal (PPI) scans like the example below were collected during the 3-month field experiment. The color images below are just one pair (horizontal scan on left, vertical on right) when a density current front was passing over the experimental area.

5. Algorithm: Cross-correlation
Calculation of one vector from a pair of REAL scans:

6. Data processing
Method used for making time-series comparisons:

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8. Two-component flow fields

Reference: