Two-component horizontal wind vectors from the Raman-shifted Eye-safe Aerosol Lidar (REAL)
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Doppler lidars provide a direct measurement of only the radial component of air motion (see top scan area in above figure). Two velocity components are necessary for wind speed and direction (see bottom scan area in above figure).

## 5. Algorithm: Cross-correlation

Calculation of one vector from a pair of REAL scans:


[^0]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.
7. Comparisons with sonic anemometer data



| 10:00 | $10: 30$ | $11: 00$ | $11: 30$ | $12: 00$ | $12: 30$ | $13: 00$ | $13: 30$ | $14: 00$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |

 Strong wind case



## 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

8. Two-component flow fields


## Reference

Mayor, S. D., J. P. Lowe, and C. F. Mauzey, 2012:Two-component horizontal aerosol motion vectors in
the atmesphes the atmospheric surface layer from a cross-co
data, $J$ Atmos. Ocean. Technol., $29,1585-1602$.


[^0]:    Acknowledgment: NSF AGS 0924407 (Physical and Dynamic Meteorology Program).

