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Turbulence data and pulse tracking with a bistatic sodar

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The group at Auckland has, together with Atmospheric Systems Corporation, developed a new sodar which has a central vertically-pointing transmitter and up to four scanning arrays of microphones, each 20-40 m from the transmitter. The receiver arrays are post-phased so that they can focus their sensitivity onto any common region within the atmospheric column covered by the transmitter beam. The objective for this system is to provide common volume sampling so as to avoid the spatial variability errors typical of conventional lidars and sodars in complex terrain. Our field trials have produced some surprising but encouraging results. These include the fact that the data availability is higher for this system than for a conventional commercial sodar. But more interestingly, we find we can locate the transmitted pulse in space at any particular time. This has led to some discoveries about wind drift of the acoustic pulse, in which the pulse was not exactly where we expected it to be. Furthermore, by placing receivers at several different distances from the transmitter, we are potentially able to recover ${C_T}^2$ and ${C_V}^2$ profiles with some accuracy, owing to the superior signal-to-noise performance of this system. We discuss these results, and how we expect to apply them.