Development of an L band Wind Profiling Radar

Bronwyn Dolman[1+2], Iain Reid[1+2], Richard Mayo[1], Gary Jonas[1] and Christian Adami[1]
[1]ATRAD Pty Ltd
[2]University of Adelaide

Wind profiling radars (WPR) operate at frequencies from VHF through to the L-band, and in addition to their traditional function of profiling the vertical and horizontal winds are used to retrieve information on rainfall, atmospheric layers and turbulence. Frequency choice depends on user requirements, with the sensitivity to various atmospheric effects changing with frequency.

WPR's operating in the lower VHF, typically near 55 MHz, have roughly equal sensitivity to echoes from clear-air and precipitation, and thus can be used to obtain vertical profiles of the vertical and horizontal wind in all weather conditions. At this frequency, rain drops less than 1mm cannot be resolved, and thus a significant portion of the rainfall distribution is lost. Lower VHF WPR's also tend to have physically larger antenna apertures than those at higher frequencies. WPR's operating in the lower UHF, typically near 450 MHz, are more sensitive to precipitation than clear-air, and thus in all but light rain the clear-air signal is lost. L-band WPR's, typically operating in the UHF band near 1290 MHz, are more sensitive to rainfall than lower UHF WPR's, and thus can resolve even the lightest rain. Clear-air information is required to correct the rainfall echo for beam broadening effects, and thus the optimal configuration is to co-locate a VHF WPR with a lower UHF or L-band WPR, to use the lower VHF for clear-air, and the higher frequencies for rainfall echoes.

ATRAD Pty Ltd operate two lower VHF band radars, at Buckland Park and Adelaide Airport, a UHF also at Adelaide Airport, and are developing an L-band system the antenna for which is currently on ATRAD's roof in Thebarton. Part of the L-band development process has been to investigate various antenna types, moving away from the traditional Yagi's typically used. Various interesting effects have been observed in the development path, including noting various sensitivities between the frequencies, observing radiosonde ascents on multiple radars, and the increased sensitivity to bugs and bats at L band. Various case studies along the development path will be presented.