6.11 THE PROUST RADAR

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The ST radar called PROUST (Prototype de Radar pour l'Observation en UHF de la Stratosphere et de la Troposphere) is located at Saint Santin (44°39'N; 2°12'E, altitude: 351 m) in the southwestern part of France, a place devoted to the ionospheric incoherent-scatter radar transmitter facility. It works at 935 MHz using the same klystron and antenna as the incoherent-scatter radar. The use of this equipment for ST work has required some important modifications of the transmitting system and the development of receiving, data processing and acquisition devices. This work has been planned in several stages. In the first stage (1984, 1985), the radar worked in a bistatic mode with a height resolution of 600 m and a time resolution of 46 s. The main characteristics of the radar is given in Table 1.

TABLE 1

Frequency	935 MHz
Allotted bandwidth	± 5 MHz
Pulse peak power	140 kW
Transmitting Antenna	2000 m^2 (Near field)
Receiving Antenna (Parabolic)	95 m^2
Pulse length	4 µs
Pulse repetition frequency	156.2 µs
Number of gates	32

As the angle between the transmitting and receiving directions is 1°, the vertical wind is mainly measured. In any case, an estimation of the horizontal wind contribution may be obtained through radiosonde data. Two campaigns were carried out and their main results are given by BERTIN et al. (1985).

In 1985, the phase stability of the transmitter-receiver set has been improved and the coding and decoding system, which leads to a 30-m height resolution, implemented (PETITDIDIER et al., 1985a). Table 2 gives the specifications of this "magnifier" mode.

TABLE 2

Pulse width	4 µs
Number of subpulses	20
Subpulse width	200 ns
Code	Quasi-complementary
Coherent integration number	128
Coherent integration time	20 ms
FFT	256 points
Spectral resolution	3.1 cm/s
Maximal vertical velocity	± 4 m/s

In a first step, only 32 gates out of the 640 decoded ones, are recorded in order not to modify the data recording device. These 32 gates are constituted by 4 groups of 8 gates in succession which may be located anywhere in the range of altitude. In September 1985, all the equipment was tested at Saint Santin. A calibration was carried out and showed that, with a spectral wind resolution of 0.8 cm/s and an amplitude of the artificial dopplerized signal 50 dB below the maximum value detectable, it is possible to detect a wind of about

2 cm/s. During the campaign, only very weak C_n^2 (10^{-18} at 2 km) were observed due to the stability of the weather.

FUTURE DEVELOPMENTS

Spectrum Computation On-line. So far, only the real and imaginary time series are recorded on magnetic tapes and the spectra are computed off-line. The next step is the computation in real time of spectra using the Texas Instruments TMS 320 signal processor and a FFT algorithm. The implementation of this device is under tests and the first campaign is planned at the beginning of 1986.

Monostatic Mode. As shown in Figure 1 and confirmed by experiments, in the bistatic mode the energy budget of the system, klystron and antenna, does not allow observation of echoes above 9 km. But in the monostatic mode, it should allow stratospheric observations. The next step, planned for 1986, will be to transmit and receive on the large antenna.

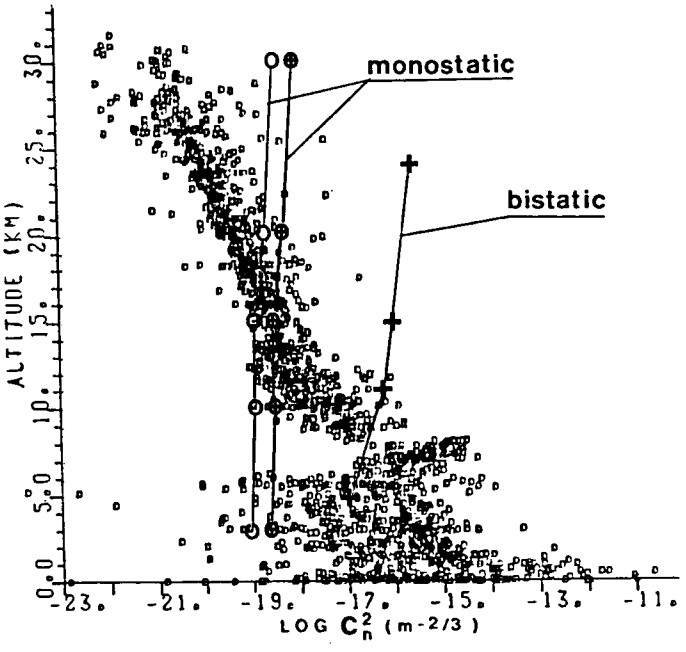

Figure 1. Variation of C_n^2 as a function of altitude using the model of VANZANDT et al. (1978) and 105 rawinsonde data from Bordeaux (France) from PETITDIDIER et al. (1985b). The curves O--O and +--+ indicate the minimum of C detectable as a function of altitude in monostatic and bistatic mode, respectively, for a peak power of 140 kW, and the curve -- in monostatic mode for 50 kW peak power.

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