In 2011 the Leibniz-Institute of Atmospheric Physics in Kühlungsborn completed the installation of the Middle Atmosphere Alomar Radar System (MAARSY) on the North-Norwegian island Andøya. MAARSY is a 53.5 MHz monostatic radar with an active phased array antenna consisting of 433 Yagi antennas. The 3-element Yagi antennas are arranged in an equilateral triangular grid forming a circular aperture of approximately 6300 m². Each individual antenna is connected to its own transceiver with independent phase control and a scalable power output of up to 2 kW. This arrangement provides very high flexibility of beam forming and beam steering with a symmetric radar beam of a minimum beam width of 3.6°. The system allows classical beam swinging operation as well as experiments with simultaneous multiple beams and the use of interferometric applications for improved studies of the Arctic atmosphere from the troposphere up to the lower thermosphere with high spatio-temporal resolution. Standard observations of tropospheric winds and polar mesosphere summer echoes started immediately with an initial stage of expansion in spring 2010. Meteor head echo experiments and 3D observations of polar mesospheric winter echoes were conducted after an upgrade of the system in December 2010. Multi-beam experiments using up to 97 beams quasi-simultaneously in the mesosphere have been carried out during campaigns in summer 2011 with the completed system. We present a system description of MAARSY including beam pattern validation and show initial results from various campaigns obtained during the first 2 years of operation.