We report the first simultaneous measurements of temperatures by a mobile Fe resonance lidar and polar mesosphere summer echoes (PMSE) by a VHF radar both located at Davis, Antarctica (69°S, 78°E). The lidar was installed at Davis in December 2010 and measures temperatures in the iron layer, i. e. approximately from 80 to 100–km. It is based on probing the Doppler broadened resonance line of iron atoms and can operate under daylight conditions. Typical values for temperature uncertainty, altitude and time resolutions are 3-5 K, 1 km, and 1 hour, respectively. The 55 MHz VHF radar performs measurements since February 2003. Several hours of simultaneous lidar/radar observations are now available from the Antarctic summer season 2010/2011. Ice particles in the summer mesosphere can be detected by lidar (‘noctilucent clouds', NLC) and also create strong radar echoes known as PMSE. The existence of ice particles relies on temperatures being lower than the frost point temperature. Temperatures measured by our Fe lidar are generally very low in the mesopause region but occasionally show some unexpected features. For example, we sometimes find the mesopause at significantly higher altitudes compared to similar latitudes in the northern hemisphere. The VHF radar frequently detects PMSE. Temperatures are below the frost point at PMSE altitudes assuming reasonable water vapor concentrations. To our surprise PMSE were persistently absent at altitudes where temperatures are much lower than the frost point. We note that (apart from low temperatures) more ingredients are required for PMSE, for example, charged ice particles of sufficient size, background electrons, neutral air turbulence etc. We present a first overview of our measurements at Davis and discuss potential explanations for the presence and absence of PMSE.