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Passive microwave remote sensing of soil moisture has been addressed by many research programs, for several decades. Various airborne and in situ radiometers have been developed, showing the high potential of L-band measurements for the estimation of surface parameters. The Soil Moisture and Ocean Salinity (SMOS) satellite mission, based on an aperture synthesis L-band radiometer was successfully launched in November 2009. In the context of a validation campaign for the SMOS mission, intensive airborne and in situ observations were performed in southern France for the SMOS CAL/VAL, from April to May 2009 and April to July 2010. The CAROLS "Cooperative Airborne Radiometer for Ocean and Land Studies" L band radiometer was designed, built and installed on board the French ATR42 research aircraft. In spring 2010, soil moisture observations from 12 stations of the SMOSMANIA network of Météo-France (www.ipf.tuwien.ac.at/insitu/) were complemented by airborne observations of the CAROLS L-band radiometer, following an Atlantic-Mediterranean transect in southwestern France. The first CAL/VAL results include a comparison between the surface soil moisture retrieved from the brightness temperatures measured during the CAROLS flights with either in situ (SMOSMANIA network and additional measurements) or synthetic soil moisture simulated by the SIM (Safran-Isba-Modcou) hydrometeorological model (Habets et al. 2008). It also includes a comparison between L-band brightness temperatures from CAROLS and SMOS, and between soil moisture values retrieved from CAROLS and SMOS. The latter are compared with the in situ observations of soil moisture, and with surface soil moisture estimates derived from the EUMETSAT ASCAT C-band scatterometer. Also, simulated soil moisture estimates produced by the ISBA-A-gs land surface model (Calvet et al. 1998) are used in the cross-evaluation and the biophysical variables produced by ISBA-A-gs are used as input to the CMEM microwave emission model (De Rosnay et al. 2009) to simulate brightness temperatures.