1.36 PRELIMINARY RESULTS ON MICROPHYSICAL CHARACTERIZATION OF PRECIPITATION OVER ANTARCTICA COAST

N.ROBERTO[1],L. BALDINI[1], A. BRACCI[12], M.MONTOPOLI[1], E. ADIROSI[1], E.GORGUCCI[1], C. SCARCHILLI[3], P. GRIGIONI[3], V. CIARDINI[3], F.PORCU'[2]

[1]Institute of Atmospheric Sciences and Climate (ISAC)- CNR Rome, Italy
[2] University of Bologna, dept. of Physics and Astronomy, Italy [3] ENEA, Italy
n.roberto@isac.cnr.it

Knowledge of the snowfall spatial and temporal variability in Antarctica is essential to define the impact of the ice sheet on sea level rise. To date, the main source of precipitation evaluation is indirectly through snow accumulation measurements but during recent years satellite observation seems to give promising result.

However, satellite measurements and related products need for calibration and validation with observations from ground sensors. In spite of its key role, available measurements of precipitation at ground are scarce in Antarctica and not appropriate to give an adequate representation of specific microphysical characteristic of precipitations especially in terms of scattering and absorption properties of ice particles.

Recently, different stations in Antarctica (Princess Elizabeth, McMurdo, Mario Zucchelli, and Dumont d'Urville) have been equipping with observatories for cloud and precipitation. The setup of a long term experiment at the Italian Station Mario Zucchelli (MZ, Latitude 74° 41' 42" S; Longitude 164° 07' 23E"), in the Terranova Bay area, plans to integrate the current instrumentation for weather measurements with other instruments specific for precipitation observations, in particular, a 24-GHz vertical pointing radars such as the Micro Rain Radar (MRR), and optical disdrometers. The synergetic use of MRR and disdrometers allows for characterizing precipitation and studying properties of Antarctic precipitation such as dimension, shapes, fall behavior, density of particles as well as particles size distribution, particles terminal velocity, reflectivity factor including some information on their vertical extent.

During last Italian Antarctic expedition an OTT Parsivel disdrometer and an MRR were installed on the roof of a logistic container (at 6 m of height) of the MZ station . The disdrometer measures size and fall velocity of particles, passing through a laser matrix from which the Particle Size Distribution (PSD) is obtained. The OTT Parsivel manufacturer software assumes spherical shape to compute the size and the fall velocity of ice particles. In the case of solid precipitation, this assumption can be unrealistic, but, averaging over a long time the influence of irregular shape of the particles can be reduced. Despite this known limitation, such instrument has been used in several studies to measure falling snow. In this work, some preliminary measurements from OTT Parsivel at MSZ during summer season are presented. In particular, the PSD collected during summer seasons 2016-2017 and 2017-2018 are analyzed in order to infer microphysical characteristics of snows in Antarctica. A specific methodology to estimate the snow rate from snow size spectra collected by Parsivel is investigated. In order to understand the relation between ice particles microphysical properties and the vertical pointing 24 GHz backscattering

cross section, some numerical simulations are also performed by using the particle size distribution provided by the in-situ disdrometers. Simulations are driven by a pre-computed discrete dipole approximation (DDA) database for complex shape particles and carried out by the T-matrix model for spheroids with different aspect ratios, density and falling behavior. The results of this work will be of practical interest giving an important contribution toward a more accurate quantification of snow deposit in the Antarctica region.