HYDROMETEOR CHARACTERISTICS UNDER LAND-OCEAN AND URBAN-RURAL INTERFACES

AUGUSTO JOSÉ PEREIRA FILHO
FELIPE VEMADO

LABHIDRO

Department of Atmospheric Science
Institute of Astronomy, Geophysics and Atmospheric Science, University of São Paulo

INTRODUCTION

Several SPOL systems have been installed in Brazil, recently. Two SPOL dataset records of 2015 are used to characterize hydrometeors of convective systems under different boundary layer conditions over land, ocean, urban and rural areas of São Paulo and Espírito States as shown in Fig. 1. The hydrometeor types and associated microphysics are examined by means of polarimetric variables such as ZDR and KDP to indicate possible CCN (ESWR) and differential heat effects (SPWR) under these four boundary layer types.

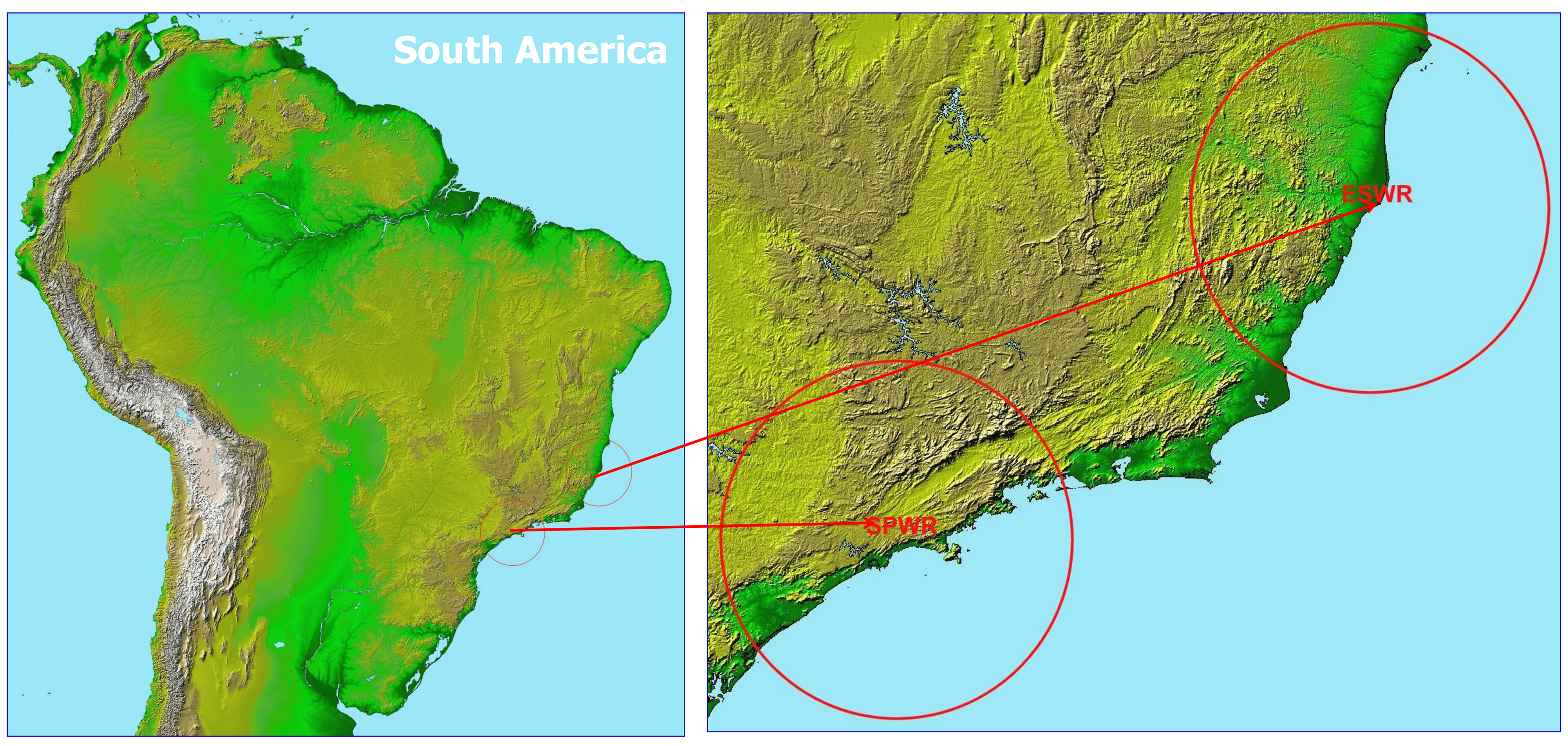

Figure 1: Location of the São Paulo (SPWR) and Espírito Santo Weather (ESWR) S-POL radars. Topography indicated by color (green tons lower altitudes; brown higher).

METHODS

The SPWR and the ESWR datasets recorded between JAN-APR 2015 ai DEC 2015–APR 2015, respectively, were used. Both weather radars ha identical features. The SPWR and the ESWR operate with 11 and elevation angles, respectively, both at 5 min. intervals. The lowest P and selected cross-sections in between two distinct boundaries we used to analyzed horizontal and vertical structures of weather systen respectively. Average (e.g., Fig. 2) and standard deviation we obtained for Z, ZDR, KDP, V, W and RoHV.

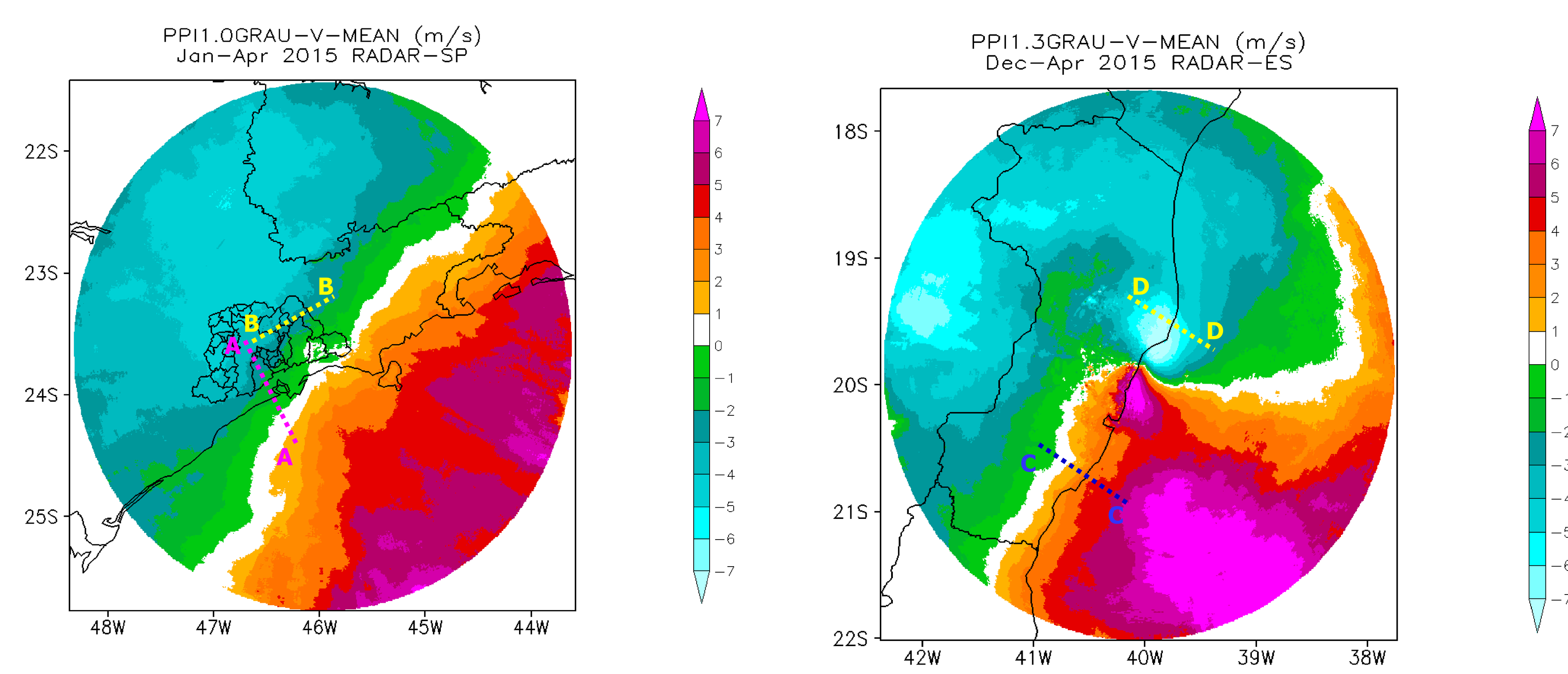

Figure 2: Average radial wind field for the SPWR (left) and the ESWR (right). PPI elevation angles, time span, geographic boundaries, latitudes and longitudes and radial wind intensity are indicated.

RESULTS

Fig. 2 (left) shows the average radial wind prevails from NW consistent with observations (not Shown), while Fig. 2 (right) indicates a low level jet and warm advection signature Northward, also consistent with observations (not shown). Fig. 3 (top) shows average vertical profiles of ZDR for the cross-sections indicate in Fig. 2. Overall raindrops tend to be larger over the Metropolitan area of São Paulo from the surface to up to 6 km altitude indicating heat island effect and the local sea breeze (Pereira Filho et al. 2013).

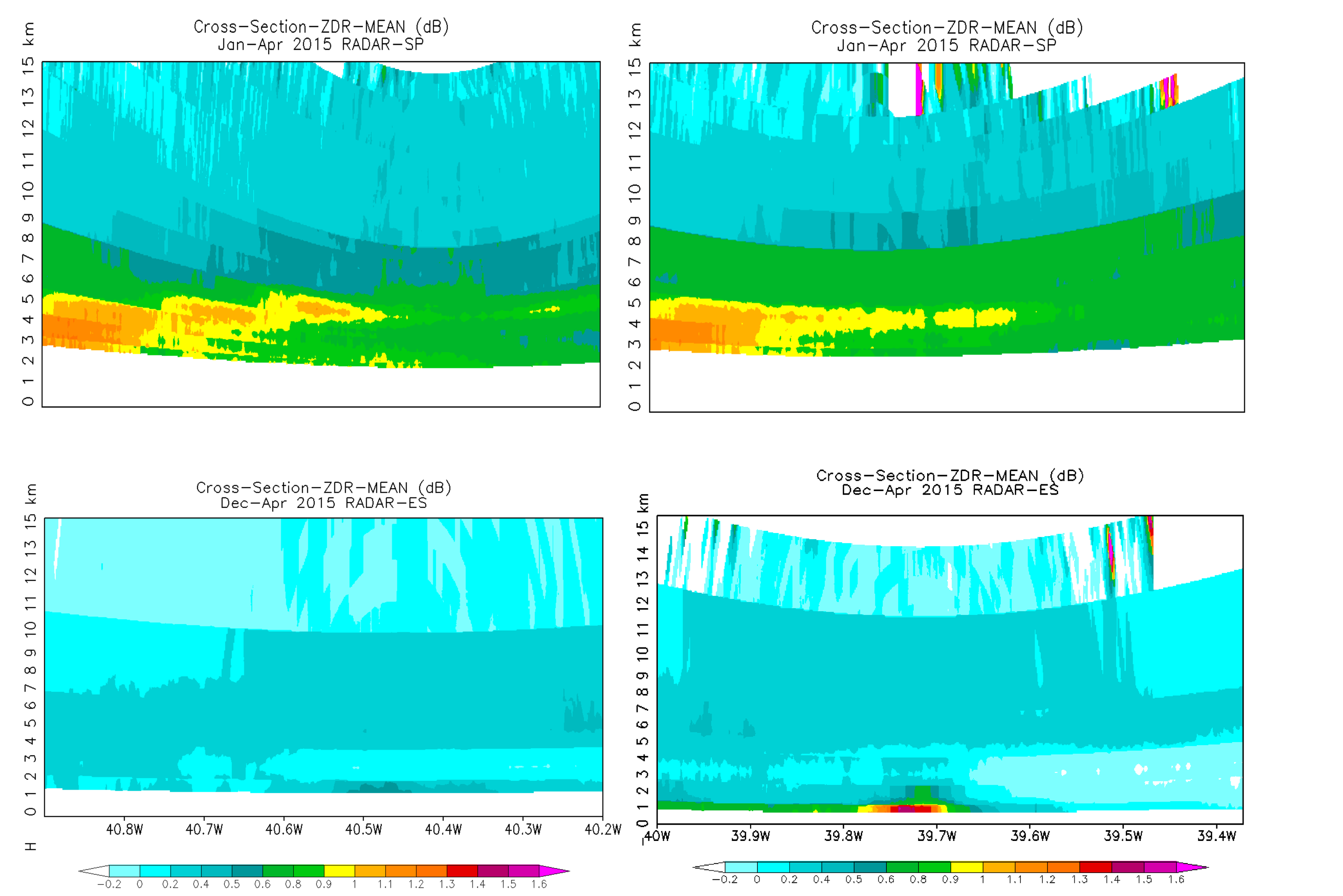

Figure 3: Cross-sections AA (left) and BB (right) (Fig. 2 left) and CC (left) and DD (right) (Fig. 2 right) of ZDR (dB) average for the SPWR and the ESWR, respectively. Scales are indicated.

The ESWR average ZDR profiles (Fig. 3 (bottom)) indicates the dominancy of smaller drop sizes though larger ones are observed close to surface Northward of the ESWR right at the land-ocean interface. Cells tend to be smaller associated to Easterlies and more organized with Westerlies. Few convective events were measured with the ESWR.

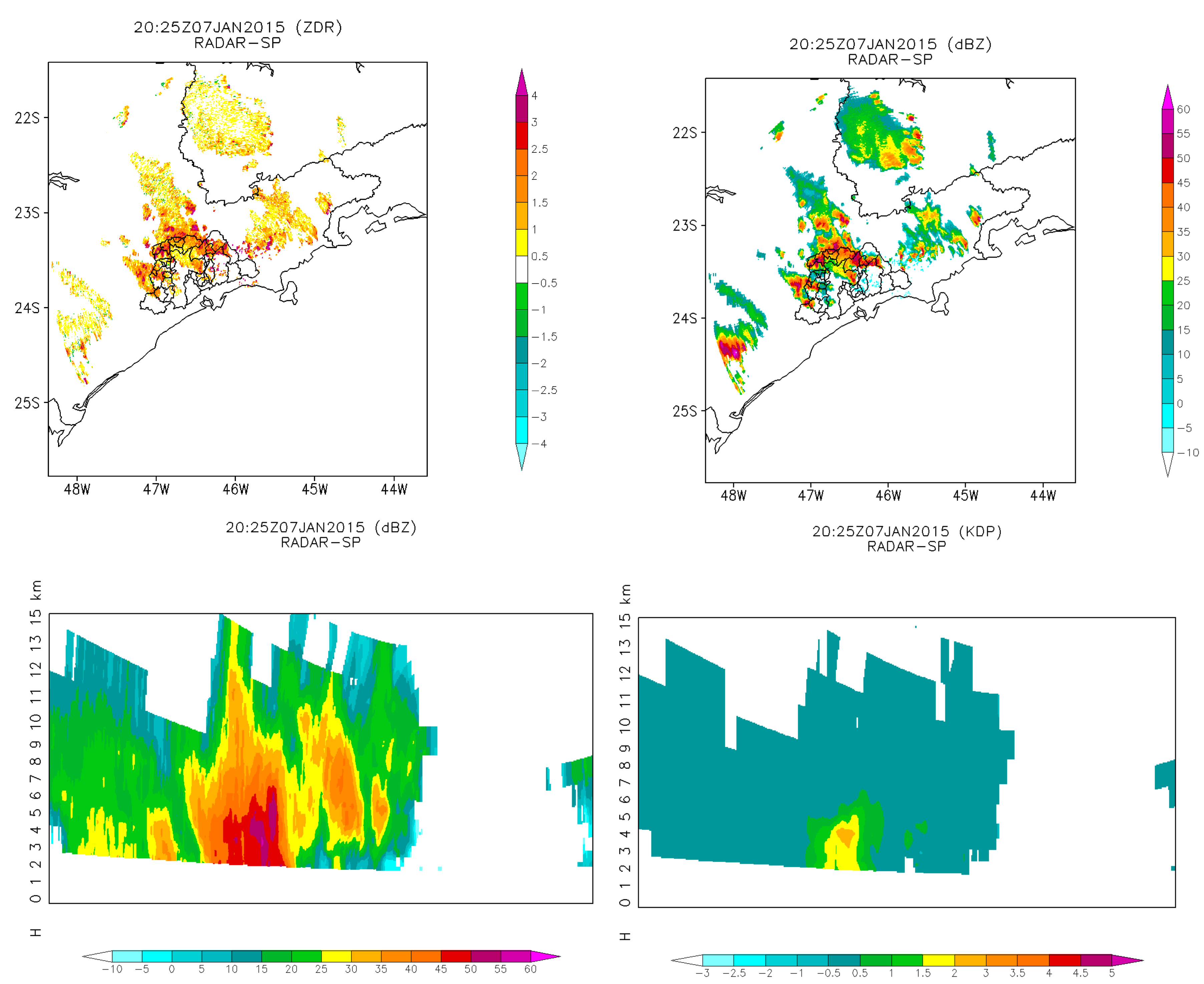

Figure 4: SPWR 1.0 deg. PPIs of ZDR and Z (top) and cross-sections BB (Fig. 2 (left) of Z and KDP on 2025 UTC 07 JAN 2015.Geographic boundaries, latitudes and longitudes and scales are indicated.

CONCLUDING REMARKS

The new SPOL weather radars available in São Paulo and Espírito Santo are important new data sources to study specific dynamics and microphysics under continental and oceanic and urban and rural environments. For instance, the heat island effect in the metropolitan area of São Paulo (Fig. 4) produces very deep thunderstorms affected by a rich urban CCN boundary layer with distinct polarimetric variables overall features as high values of ZDR at lower levels and negative KDP aloft. Further studies are being carried out to improve nowcasting tools.

REFERENCES

Available in the paper.