Extended and Persistent Surface Based Radio Frequency Ducting over Arid Land

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Surface based radio frequency (RF) ducts are formed in the entrainment layer between the near surface mixing layer and the free atmosphere. The vertical gradients of temperature and water vapor across the entrainment layer determine the strength of the surface based duct. Over land, the mixing layer grows in height during the day often causing an early morning surface based duct to become an elevated duct. If the air in the free atmosphere is sufficiently dry in terms of water vapor, the duct has the potential to remain surface based during the diurnal cycle.

In July of 2012, a shallow low pressure system over the Red Sea pumped dry air from the arid regions east of the Red Sea in counter-clockwise flow over the Mediterranean Sea and onshore over Egypt. During the day, the mixing layer and duct base heights were high enough that elevated ducts and weak surface based ducts were observed over land while surface based ducts were observed over the Mediterranean Sea. Overnight as the land mass cooled, the duct base heights were reduced over land such that strong surface based ducts were observed both on land and over the Mediterranean Sea. The ducts were strong enough along certain bearings to allow positive propagation factors behind terrain.

This presentation will present the results of a case study for this event that employed the Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS®) to resolve the diurnal refractivity fields and the Advanced Refractive Effects Prediction System (AREPS) to model the resulting propagation factor fields.