Inverting for maritime propagation environments using proper orthogonal modes from radar imagery data

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Radar wave front arrival times and spatial energy deposition, associated with propagation through a given marine atmospheric boundary layer, may be described using proper orthogonal modes, and subsequently represented as points on a compact Stiefel manifold. By exploiting the Riemannian structure of Stiefel, interpolation within the cloud of manifold points is possible when solving inverse problems aimed at uncovering *in situ* maritime conditions affecting radar propagation on a given day.

The foregoing may be effected though conceptualizing the marine atmospheric boundary layer (MABL) as a kind of "blurring operator", acting on microwave radiation propagation (Figure 1). The present approach hinges on the construction of a reasonable library of well characterized (in the sense of the quantity of interest for observation) MABL environments obtained using a certain type of spatial sampling: schematically depicted in (Figure 2).

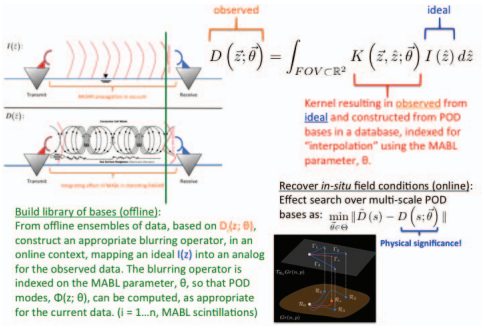

Figure 1: Inversion framework based on EM "blurring"

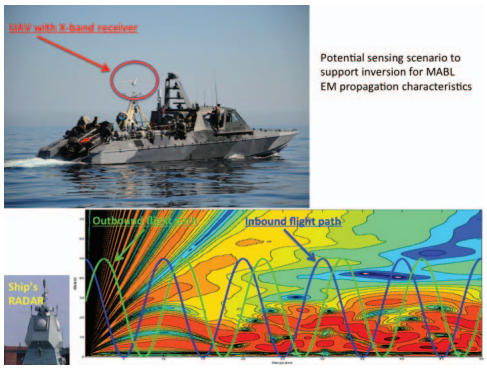

Figure 2: Sensing schema