

Abstract: Analyzing sparse line-of-sight velocity sampling obtained from a conically scanning doppler radar system envisaged for the WIVERN mission (WInd VELOCITY Radar Nephoscope, <https://wivern.polito.it/>) [1,2], we present a data inversion methodology for reconstructing 2D horizontal wind field inside stratiform areas, weather systems where convective motions can be neglected. We present a multiscale approach to improve the precision and efficiency of the horizontal wind field reconstruction. The process entails iteratively by applying an optimization technique to match modelled data with observed data, where constraints are imposed by the continuity equation in order to obtain physically consistent and interpretable results.

[1] Illingworth, A. J., Battaglia, A. et al., 2018: Wivern: A new satellite concept to provide global in-cloud winds, precipitation and cloud properties. *Bull. Amer. Met. Soc.*, DOI: 10.1175/BAMS-D-16-0047.1, 1669-1687.

[2] Battaglia, A., Martire, P., Caubet, E., Phalippou, L., Stesina, F., Kollias, P., Illingworth, A., 2022: Observation error analysis for the WInd VELOCITY Radar Nephoscope W-band Doppler conically scanning spaceborne radar via end-to-end simulations, *Atmos. Meas. Tech.*, DOI: <https://doi.org/10.5194/amt-15-3011-2022>