The balance between the plasma production, loss, and transport processes dominates the temporal and spatial distributions of the ionospheric plasma density. For instance, neutral winds along magnetic meridian in the mid-latitude and the zonal electric fields in the low-latitude ionosphere are intimately related to variations in the F2 layer peak density (NmF2) and the peak height (hmF2). While observations of the neutral wind and electric field in the ionosphere and thermosphere are scarce, observations of plasma density are now relatively abundant thanks to the FORMOSAT-3/COMSIC missions and the global network of ionosondes. In this study, we explore the use of NmF2 and hmF2 observations as drivers to a physical-based ionospheric model to infer neutral winds and zonal electric fields.