Knowledge about the range of states that the topside ionosphere can assume and the conditions that give rise to them is essential for improving existing models used in a host of practical and research applications. Still, the topside is at best a partially explored region. Electron density profiles (EDPs) acquired during COSMIC-GPS radio occultation events offer promise for fuller views of the topside. However, their reliance on Abel inversions has given users pause. This presentation proceeds in three stages: First, we review the physics and mathematical techniques underlying EDP extractions during occultation intervals as well as the measurement capabilities of other relevant in situ sensors. Second, recognizing that reliance on Abel inversions constitutes the remote-sensing technique's Achilles heel we performed a limited comparison of COSMIC EDPs with electron densities measured by sensors on the Communications/Navigation Outage Forecast System (C/NOFS) satellite during conjunction intervals. Results show that COSMIC EDPs were in closer agreement with ion densities measured by the C/NOFS than were those predicted by widely used models. Third, we outline a new technique that combines the capabilities of sensors on the COSMIC, C/NOFS and DMSP satellites to infer altitude profiles of electron and ion temperatures (Te, Ti), mean ion masses and ionospheric scale heights H at altitudes between the F-layer peak and 850 km. Data acquired during eight COSMIC-C/NOFS-DMSP conjunctions on 24 - 25 October 2011 are used to demonstrate the proposed method's feasibility then outline our plan to apply it to large databases. Our ultimate goal is to specify topside EDP taxonomies that occur at low latitudes as well as the temperature and mass distributions required to support them.