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A short dive into the complexity of Jupiter's aurorae - invited

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Aurorae are the atmospheric signatures of energetic processes taking place far in the magnetosphere. One of the most important results brought by high resolution imaging of the UV aurorae at Jupiter is the realization that there isn't such a thing as «the aurora» at Jupiter; as these light emissions appear to arise from a variety of processes. Some are related to the interaction of the magnetospheric plasma with the moons (the satellite footprints). Others are linked with the radial motion of flux tubes through centrifugal instabilities (the injection auroral signatures). Some diffuse emissions are connected with wave-particle interaction (the equatorward diffuse emissions). Another feature is associated with the magnetosphere-ionosphere coupling (the main emission/oval). Some auroral spots are related to internally driven reconnection (the polar dawn spots). Finally, the polar-most emissions remain to be understood and this list is still incomplete. In order to illustrate the discrepancies between these various features, I will show a set of recent results derived from the analysis of Hubble Space Telescope observations. For example, I will compare the vertical profile of satellite footprints and the main emissions, and show that the energy population of the precipitating particles varies from feature to feature. Moreover, even within a single feature, spatial variations do exist. As an example, I will characterize the dawn-dusk brightness discrepancy of the main emissions and discuss its implication regarding the magnetospheric currents. And finally, the dynamics of the features also helps differentiating one type of aurora from another. This will be shown through the description of the morphological evolution of the transient flares in the polar region.