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Global current systems in Jupiter's polar magnetosphere

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The Juno spacecraft has been in polar orbit around Jupiter since July 4, 2016 sampling Jupiter's environment from ~ 1.05 Jovian radii outwards, extending to the distant reaches of the Jovian magnetosphere. Juno's polar orbit makes it possible to acquire direct observations of the Jovian magnetosphere and auroral emissions above the poles for the first time. We have quantitatively measured magnetic field-aligned (Birkeland) currents which are associated with Jupiter's auroral emissions and have modelled the morphology of the currents based on observations collected along one of Juno's polar perijove passes. The structure of the field-aligned currents seems to be more complex than expected showing a dynamic filamentation in the azimuthal direction and strong asymmetries between the northern and southern regions. This complexity indicates a non-steady state generation of field-aligned currents possibly with non-linear processes involved. We present a way towards modeling the field-aligned currents more systematically extending the analysis with data from multiple perijove passes. We also show the development of a composite map of field-aligned current regions above the polar aurorae. This map gives us important information on the global structure of the field aligned currents and therefore on how angular momentum is transferred between Jupiter's atmosphere and magnetosphere.