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Statistical Characteristics of Field-aligned Currents in Saturn's Nightside Magnetosphere

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We will discuss the Saturn's high-latitude field-aligned current systems as traversed in 2008 by Cassini on sequential north-south periapsis passes in the nightside magnetosphere. Two types of current systems have previously been identified, associated with anti-symmetric azimuthal field signatures in the northern and southern hemispheres. The first exhibits exclusively 'lagging' field morphology, while the second also includes an equatorward interval of 'leading' field. Here we report the statistical characteristics of these currents, their strength, ionospheric location, and relationship to plasma boundaries. From high to low latitude the first type comprises a downward current followed by an upward current, whose strengths are $\sim$0.5-3.5 MA per radian of azimuth. The downward current maps to ionospheric colatitudes of $\sim$13.5° and $\sim$16° in the north and south respectively, usually centered in the outer magnetosphere, while the upward current maps to $\sim$16.5° and $\sim$19° in the north and south, located within the ring current region. The second type comprises a distributed downward current of $\sim$1-2 MA per radian flowing in the open field and outer magnetosphere regions, followed by an upward current of $\sim$2.5-5 MA per radian mapping to $\sim$15.5° and $\sim$18° in the north and south, corresponding to the outer magnetosphere and outer ring current, and a further downward current of $\sim$1-2.5 MA per radian mapping to $\sim$17.5° and $\sim$20° in the north and south, corresponding to the inner ring current.