The relationship between Auroral Westward Flow Channels (AWFCs) observed by TIGER and magnetospheric substorms

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Abstract. Auroral Westward Flow Channels (AWFCs) are narrow channels (~1–2°) of enhanced westward drift observed equatorward of, or overlapping, the diffuse auroral oval in the pre-midnight sector. The enhanced drift speeds are distinctly larger than background speeds associated with the normal return sunward flows in the dusk convection cell. AWFCs are strongly reminiscent of Polarisation Jets (PJs) or Sub-Auroral Ion Drift Events (SAIDs), but their occurrence is closely synchronised with substorm phase — they commence near to substorm onset and they end near to the end of recovery phase. AWFCs contribute to the development of the main ionospheric trough, and they are a part of the Sub-Auroral Polarisation Stream (SAPS). AWFCs are often observed by the Tasman International Geospace Environment Radar (TIGER) (43.4°S, 147.2°E; –54.5°Λ) in the latitude range −62°Λ to −68°Λ. We have developed software to form a simple data base of FITACF parameters which facilitates rapid searching and identification of AWFCs. These procedures can readily be applied to identify AWFCs in Hankasalmi or King Salmon SuperDARN data, for example. AWFCs exhibit a diverse range of behaviour and examples illustrating a representative cross section of their dynamics will be presented. We are in the process of compiling basic occurrence statistics of AWFCs – their locations in MLT, lifetimes, latitudinal widths, drift speeds, etc. Importantly, AWFCs are sometimes the most prominent manifestation of substorms in the radar data, and their role in the evolution of substorms, for example, whether they actually commence just before, during, or after substorm onset, is being investigated.