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Coronal plasma flows and magnetic fields in solar active regions

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During the early days of the SOHO mission, SUMER observed a few active regions (ARs) connected with sunspots on the sun and took their images and spectra in various EUV emission lines. In addition to these spectroscopic data magnetograms of the photospheric footpoint regions of the AR loops were available from the MDI on SOHO and the National Solar Observatory/Kitt Peak (NSO/KP), data which here are used to construct the coronal magnetic field of the ARs by force-free-field extrapolation. The combined data set is analysed with respect to the large-scale circulation of coronal matter, which means that the Dopplershifts of various lines used as tracers of the plasma flow are investigated in close connection with the ambient magnetic field, which is found to be either closed or open in the coronal volume considered. The Dopplershift pattern is found to be clearly linked with the field topology, and several regions of strong velocity shear are identified. We also estimate the coronal currents. We discuss the results of this mainly phenomenological correlative study with the perspective to understand coronal heating and mass supply to the extended corona, and with respect to the role played by the field in guiding and constraining plasma flows.