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Active mitigation of spaceborne radio frequency interference for VLBI

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The proliferation of spaceborne radio frequency interference (SRFI) is threatening the operation of Very Long Baseline Interferometry (VLBI). Most SRFI is caused by the excessive number of newly launched satellites, in particular from mega-constellations such as Starlink, OneWeb, or Amazon Kuiper. Some of these satellites will emit signals in the upper-frequency range that is currently observed by the next-generation VLBI system, the VLBI Global Observing System (VGOS). The power of these signals may saturate the amplifiers of VLBI antennas causing nonlinearities within the observations. Besides, some planned InSAR satellites might emit signals strong enough to permanently damage the highly sensitive VLBI hardware.

Within this work, we will investigate an active mitigation approach that modifies the current VLBI observing strategy to avoid observations in the direction of SRFI. However, active avoidance means additional constraints during the observation planning. We will investigate the impact of these constraints w.r.t. the precision of the geodetic parameters using simulations and compare it to a situation without active avoidance, where affected observations are simply removed from the simulations, and to a situation without any SRFI being present. The simulations will be conducted based on current and future VGOS networks and current and future satellite constellation expansion stages. We will demonstrate that active avoidance has the potential to pose a solution to avoid SRFI but also highlight its limitations.