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Improvement in stability and accuracy of the VLBI reference frame realized with the next generation of VLBI stations

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We are investigating the performance of a future global network of next-generation (VLBI2010) VLBI stations by performing simulations to determine optimal station locations, station specifications, and antenna observing strategies. The goal is to develop a system that will determine the terrestrial reference frame (TRF) with an accuracy of 1 mm and a stability of 0.1 mm/yr. Here we discuss how the envisioned system will improve upon the current VLBI TRF. Currently, the global coverage with VLBI antennas has poor Southern hemisphere coverage. For instance, it is likely that the presence of unmodeled annual effects in the scale time series is due to the fact that there is a predominance of Northern hemisphere stations. By analyzing results from simulations, we investigate such systematic effects seen with the current network and compare with results from the envisioned future network with a more uniform global coverage especially in the Southern hemisphere. We examine the improvement in scale and rotation parameters as the number of VLBI stations increased and the global distribution of VLBI sites is improved. We also look at the dependence of individual station accuracy/precision improvement on VLBI2010 station specifications and delay observable precision.