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The ICRF-3: The next Generation Celestial Reference Frame.

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Abstract content
   (Max 300 words)
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One part per billion (ppb) spatial resolution is required in many fields of physics in order to make progress in research. In the last several decades radio astronomers have developed a technique to achieve this ppb resolution by creating non-realtime phased-arrays of antennas. Highly stable atomic clocks allow phasing of antennas at intercontinental distances thus leading to the technique's name: Very Long Baseline Interferometry (VLBI). This technique has applications in geodesy, astrometry, astronomical imaging, astrophysics, and spacecraft navigation. We will briefly review some of these applications.

In our own research, VLBI is used to pinpoint the angular positions of extragalactic radio sources with ppb (nanoradian/200 μas) precision. From positions of hundreds of these objects spread over the full sky, global celestial references frames have been constructed. This talk will discuss efforts underway to create the next standard International Celestial Reference Frame (ICRF). Because there have historically been fewer radio telescopes in the southern hemisphere, there is a great need to increase observations from southern observatories. South Africa's HartRAO is very active in supplying these observations through collaborative efforts with Australia and other observatories throughout the world. Currently there are projects underway to improve the celestial frame at 8.4 GHz and 22 GHz. The results will be compared to complementary work at 32 GHz in order to understand frequency dependent systematic errors which may limit the registration of radio and optical reference frames such as ESA's Gaia satellite.

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