Development of GNSS capability in the "GNSS at MIT" software GAMIT

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We discuss the development of the GNSS capability in the MIT space geodetic analysis system GAMIT and the Kalman filter combination program GLOBK. The GPS analysis program developed at MIT since the mid-1980's is widely used around the world for academic research. It is made freely available to researchers and is delivered as source code. Over the last few years we have been expanding beyond the GPS capability to include other Global Navigation Satellite Systems (GNSS) in the processing. Our approach has been incremental with the addition of code multiplexed, single systems (Galileo and BeiDou) first. Each system is processed separately and then combined with the combination program GLOBK in much the same way that GPS networks can be combined. The current release of the software has this capability. In development now is processing of the frequency multiplexed system GLONASS. Frequency multiplexing poses problems in the GAMIT double difference operator approach because of the way GAMIT forms single frequency, phase based, normal equations on which a dual frequency double difference operator is applied. Since the operator chooses optimum, non-redundant combinations of satellites and stations, the correct accounting of the ionospheric delay is difficult because of the different frequencies of the satellite transmissions with GLONASS. We will report on our progress on accommodating GLONASS into the current GAMIT processing framework and our longer-term development of a new estimator for GAMIT that accommodate multiple GNSS systems and multiple frequencies bands. We will present results from GAMIT processing of IGS GNSS stations and some the 200 GNSS stations now included in the NSF funded Plate Boundary Observatory in the US.