Airborne Kinematic Ambiguity Resolution using NovAtel's Millennium Dual Frequency Receivers and Waypoint's GrafNav Post-Processing Package

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The following report outlines the results of an airborne GPS/Photogrametric mapping mission flown by Northwest Geomatics of Edmonton, Alberta, Canada. The mission employed NovAtel Millennium dual frequency receivers. The data collected during the flight was post-processed with Waypoint's GrafNav static/kinematic baseline processor.

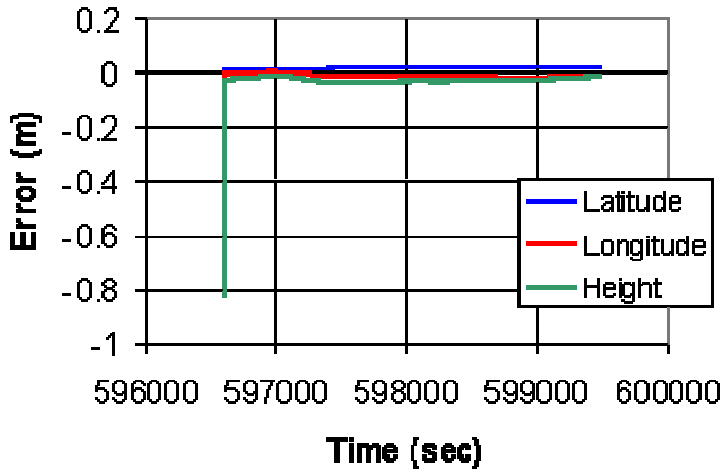
Static initialization was not performed, however, the data was processed in an on-the-fly Kinematic Ambiguity Resolution mode (KAR). To assess the accuracy of the new dual frequency units, the KAR process was implemented in six different places during the flight.

The first on-the-fly solution utilized data collected while the aircraft warmed up on the runway. The next four KAR solutions were computed while the aircraft was either accelerating down the runway or while in flight. It can be seen in the graphs that 3 of the on-the-fly solutions were obtained at distances of over 20 km from the base stations while the aircraft was at high speed and high altitude.

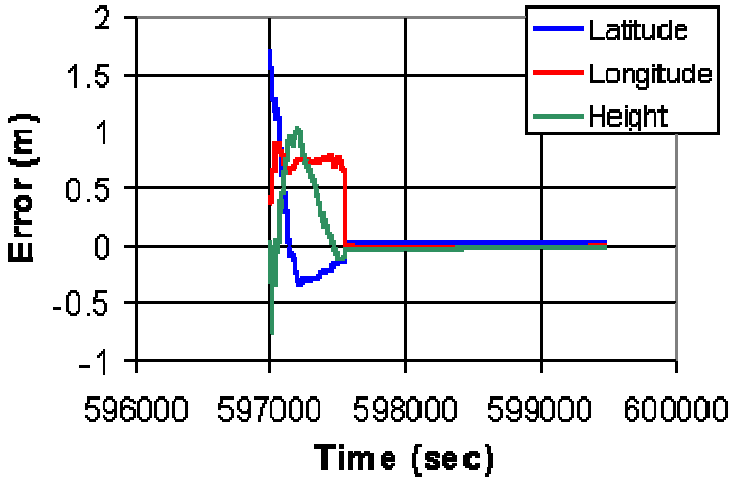
The error graphs were produced by subtracting the results of the last 5 KAR solutions from the first overall KAR solution performed while the aircraft was warming up. It can be seen that the on-the-fly ambiguity process took anywhere from 90 to 450 seconds, depending on baseline distance and aircraft acceleration.

Ultimately, all five KAR solutions agreed within 0.02 m, even at distances over 20 km and altitudes up to 6500 m.

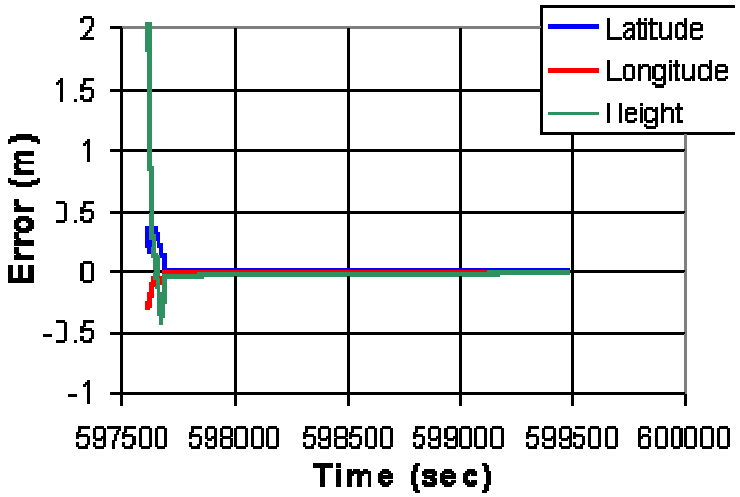
Agreement between KAR solution #1 and five subsequent KAR solutions while Airborne.



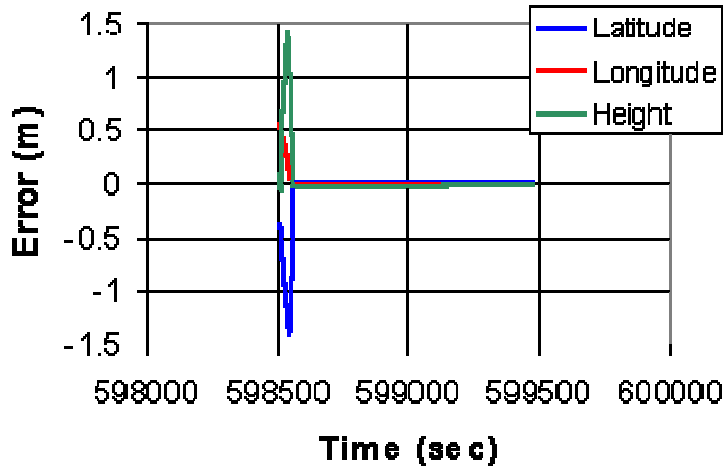
Graph 1: Baseline Distance 660 m Aircraft Speed 10 m/s Altitude 666m Ambiguities resolved in 15 sec



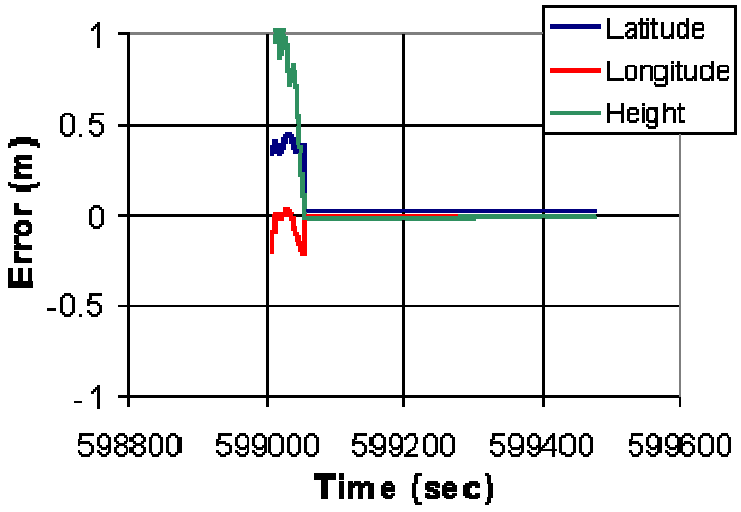
Graph 2: Baseline Distance 4200 m Aircraft Speed 65 m/s Altitude 1630 m Ambiguities Resolved in 555 sec NOTE: Airplane climbed from 600 m to 6000 m



Graph #3: Baseline Distance 23,500 m Aircraft Speed 175 m/s Altitude 6516 m Ambiguities Resolved in 90 sec



Graph #4: Baseline Distance 23,400 m Aircraft Speed 117 m/s Altitude 6506 m Ambiguities Resolved in 60 sec



Graph #5: Baseline Distance 22,700 m Aircraft Speed 149 m/s Altitude 6142 m Ambiguities Resolved in 55 sec

Conclusion

The graphs clearly indicate that even in high dynamic environments, the Millennium receiver produces data that GrafNav easily resolved to centimetre level precision using on-the-fly amibiguity resolution. This means that aerial and ground surveys can be performed to high levels of accuracy, at the baseline distances shown, reliably and effectively, using the NovAtel hardware and Waypoint software combination.

Acknowledgements

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