NAG consulting services quickly provide special quadruple precision routines for satellite sensor simulation.

At NAG we pride ourselves for our responsiveness as well as our technical understanding, so when we were presented with a request to see if we could help improve the accuracy of a complex simulation application we quickly provided the solution.

A team at Technical University Munich, Institute of Astronomical and Physical Geodesy were working on simulating gravity field solutions by using geodetic observations from a new generation satellites equipped with far more accurate sensors than those that have previously been available. The data from these new satellites can provide better insights into many gravity field related geodetic and geological applications that deal with mass changes on the Earth such as melting of ice sheets and glaciers, ocean circulation, detecting movement of tectonic plates or finding oil and other fossil fuel reserves among others.

The particular puzzle to be solved was how to improve the granularity of simulation code to match the greater sensitivity of the new satellite sensors.

The team, who started with an existing simulation, did not initially know of the NAG Library. So they initially continued with an open source double precision library to build a mixed double/quadruple precision hybrid solution - in this the simulation code used quadruple precision except for the parts where the numerical library was used in double precision. The team next tried to work with a community supported multiple precision arithmetic library by building custom wrappers for quadruple precision. However this approach didn't work because there was too large an overhead in the software changes required to incorporate the style of the library interfaces in required timescales.

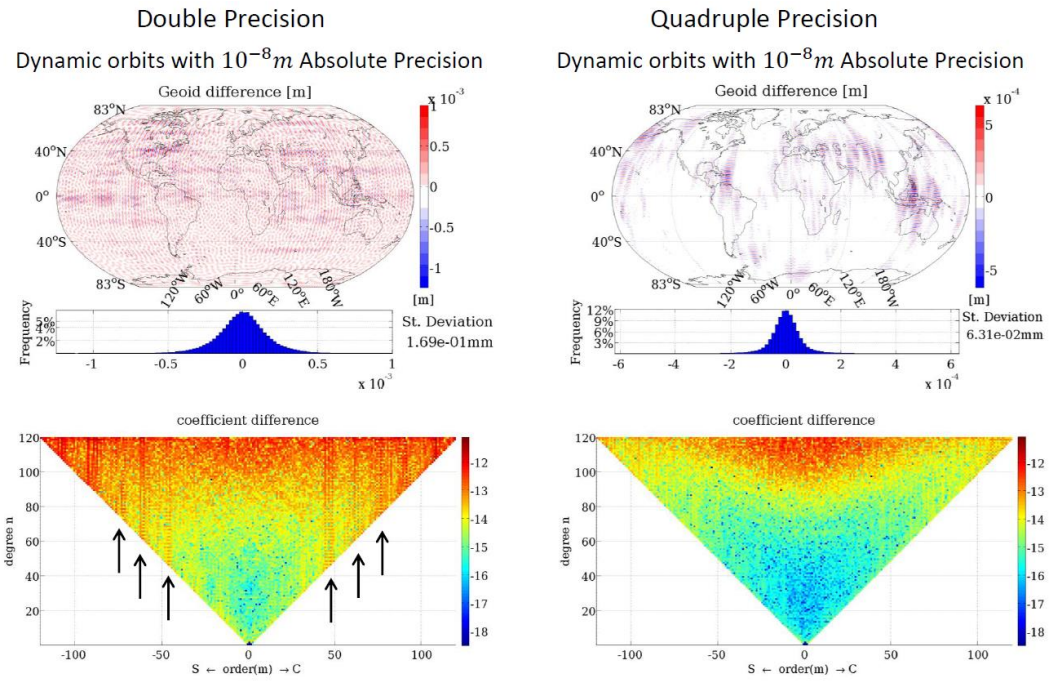

Fig – initial results indicating benefits of improved precision in simulation accuracy[1]

[1] Daras, I.; Pail, R.; Murböck, M.: Enhanced numerical precision for processing of future gravity satellite mission simulations of low-low SST type.; European Geosciences Union General Assembly 2013, Wien, 11.04.2013

A little way through the project the team discovered that the NAG Library was available at the Leibniz Rechenzentrum – the LRZ is the computer centre for Munich's universities and the Bavarian Academy of Sciences main university system. They therefore contacted the NAG support desk to ask about the availability of quadruple precision versions of the key routines that their application required.

NAG's support group analysed the requirement and quickly concluded that quadruple precision routines would indeed help for this work. A budget and timescale for the delivery of customized versions of the routines in quadruple precision was agreed. These were delivered for testing within a few weeks of the work starting and the code was then easily incorporated into the team's application within a 2 month time window.

Ilias Daras of the Technical University Munich team who is conducting the research said, 'It has been a pleasure working with NAG on this project – they immediately grasped what we were trying to achieve and were able to offer advice as well as quickly providing the quadruple precision versions of the routines that we needed. I've found that NAG provides reliable and clearly documented software. I can strongly recommend that others turn to NAG for help in improving the performance of numerical code'.

Note:
The full results of this work on gravity satellite mission simulations will be presented at a conference in September this year.