Stochastic Modelling and Quality Control for Real-Time Long-Baseline Kinematic Applications

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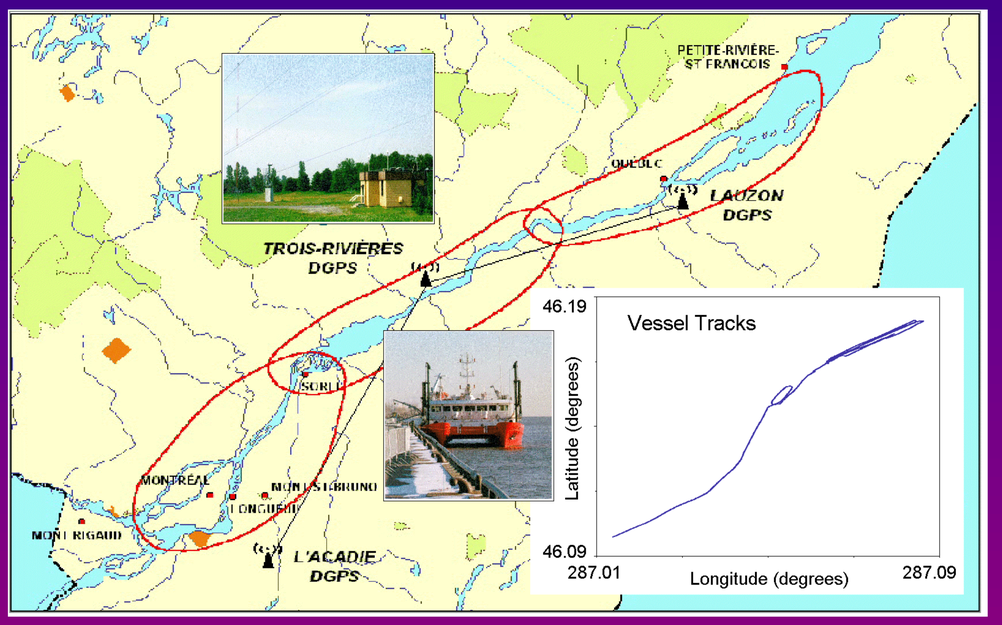
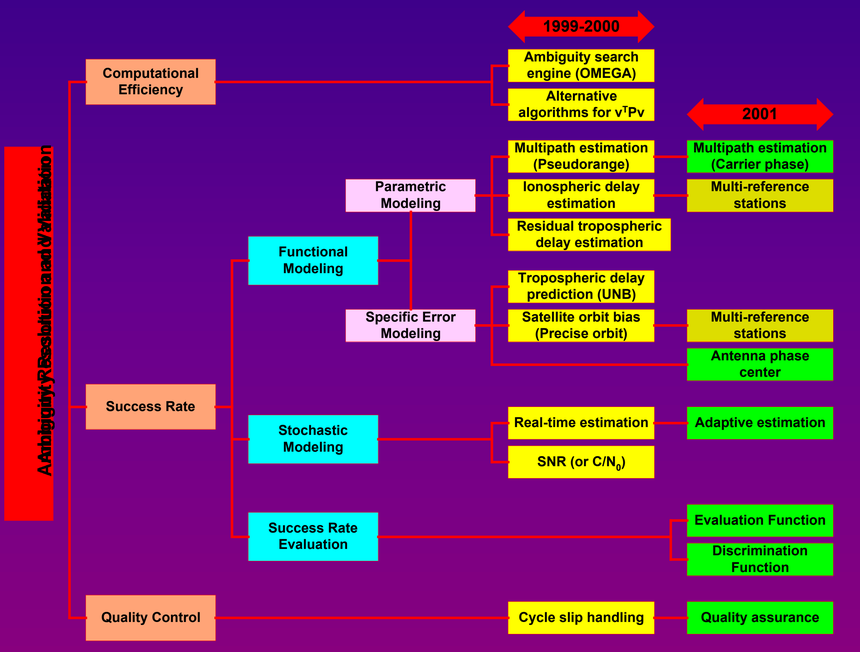
ENV#14: Improvement of Precise and Reliable Kinematic GPS Positioning in Real-time over Long Distances for the Support of Bathymetric Surveys

The Canadian Hydrographic Service in collaboration with the Canadian Coast Guard is establishing a seamless datum to modernize its bathymetric survey operations. Two main aspects of the use of a seamless datum are: 1) the relation between geodetic (ellipsoidal) height obtained from GPS and chart datum, and **2) the precise (better than 10 cm) GPS kinematic positioning (particularly the height) of a survey vessel.**



GPS Carrier-phase Positioning System Architecture



Stochastic Modelling

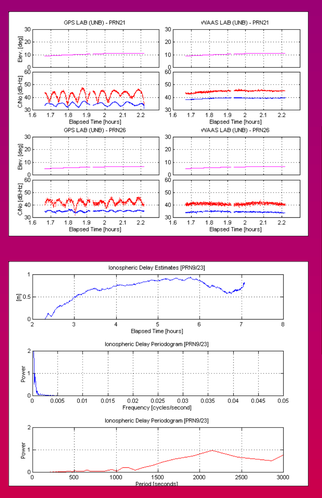
(Kim, D. and R.B. Langley (2001). ION NTM 2001 meeting, Long Beach, L.A., January 22-24)

Using a subtractive filter which is high-pass filter damping low frequency components and eliminating constant ones.

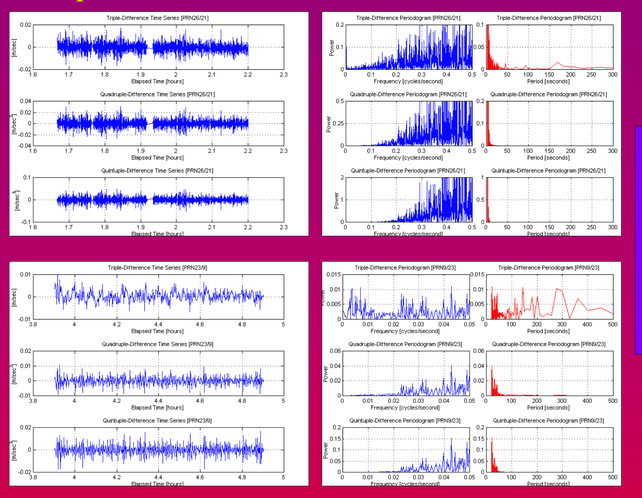
Epoch	DD	TD	QD	dQD
1	DD1			
2	DD2	TD1		
3	DD3	TD2	QD1	
4	DD4	TD3	QD2	dQD1
5	DD5	TD4	QD3	dQD2
:	:	:	:	:

DD : Double-difference
TD : Triple-difference
QD : Quadruple-difference
dQD : Quintuple-difference

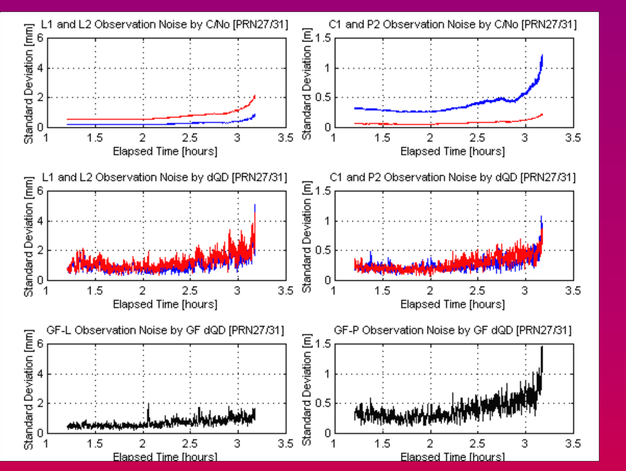
Biases and errors



High-pass filtering using a differencing process in the time domain.

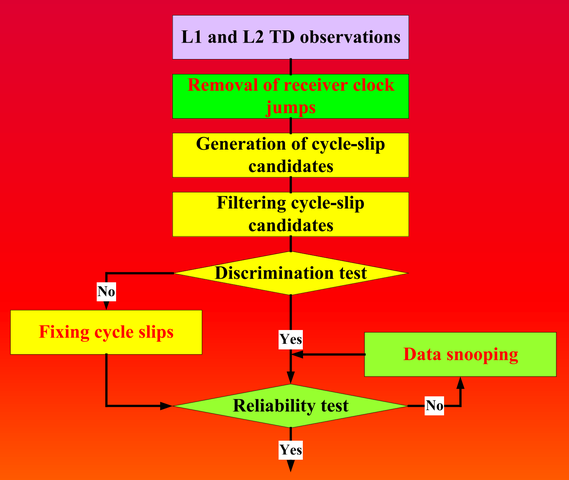


Receiver system noise estimation

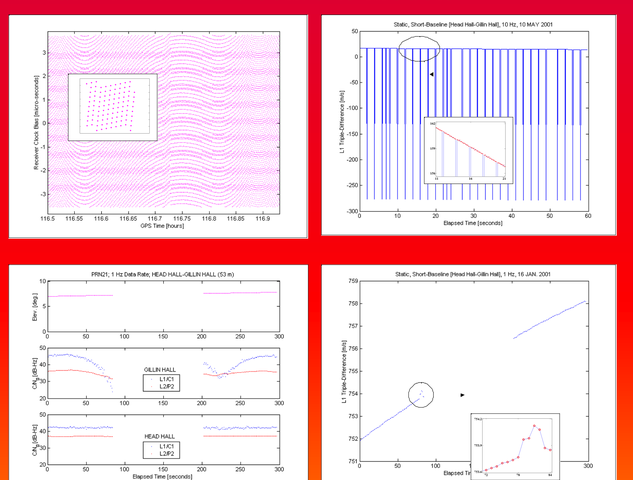


Quality Control

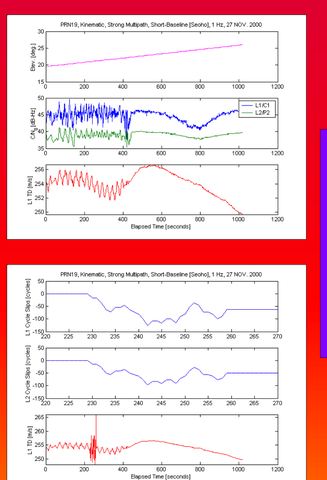
(Kim, D. and R.B. Langley (2001). KIS 2001 meeting, Banff, Alberta, June 5-8)



Systematic and quasi-random errors unspecified in functional and stochastic models.



Worst case cycle-slip simulation test.



Recovery of the simulated cycle slips.