Intra-Technique Combination at DGFI: some aspects related to DORIS

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IDS Analysis Workshop, 20 -21 February 2003

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Outline

1. Overview
2. Datum definition
3. Weighting
4. Setting velocities equal
5. Reducing parameters
6. Recommendations

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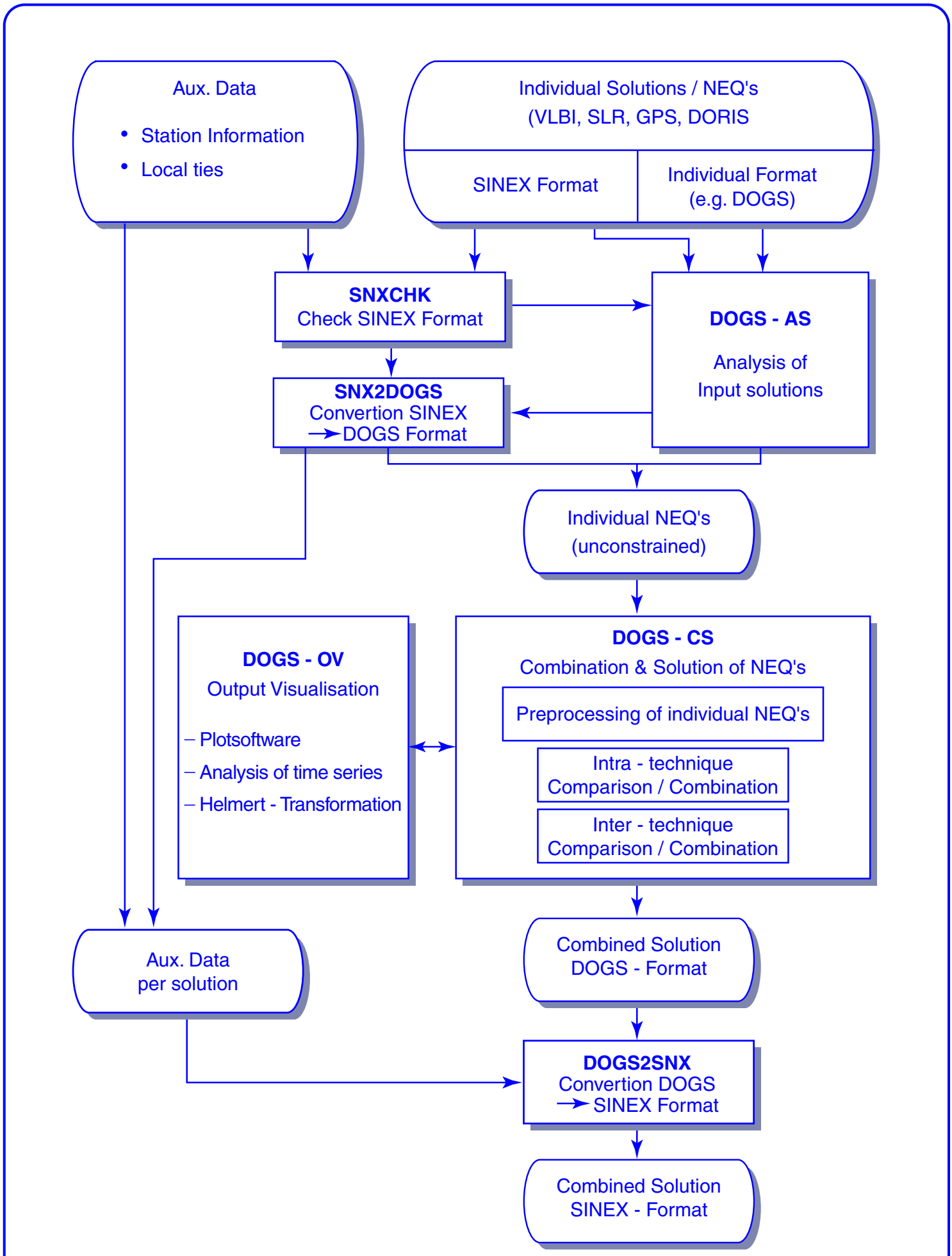

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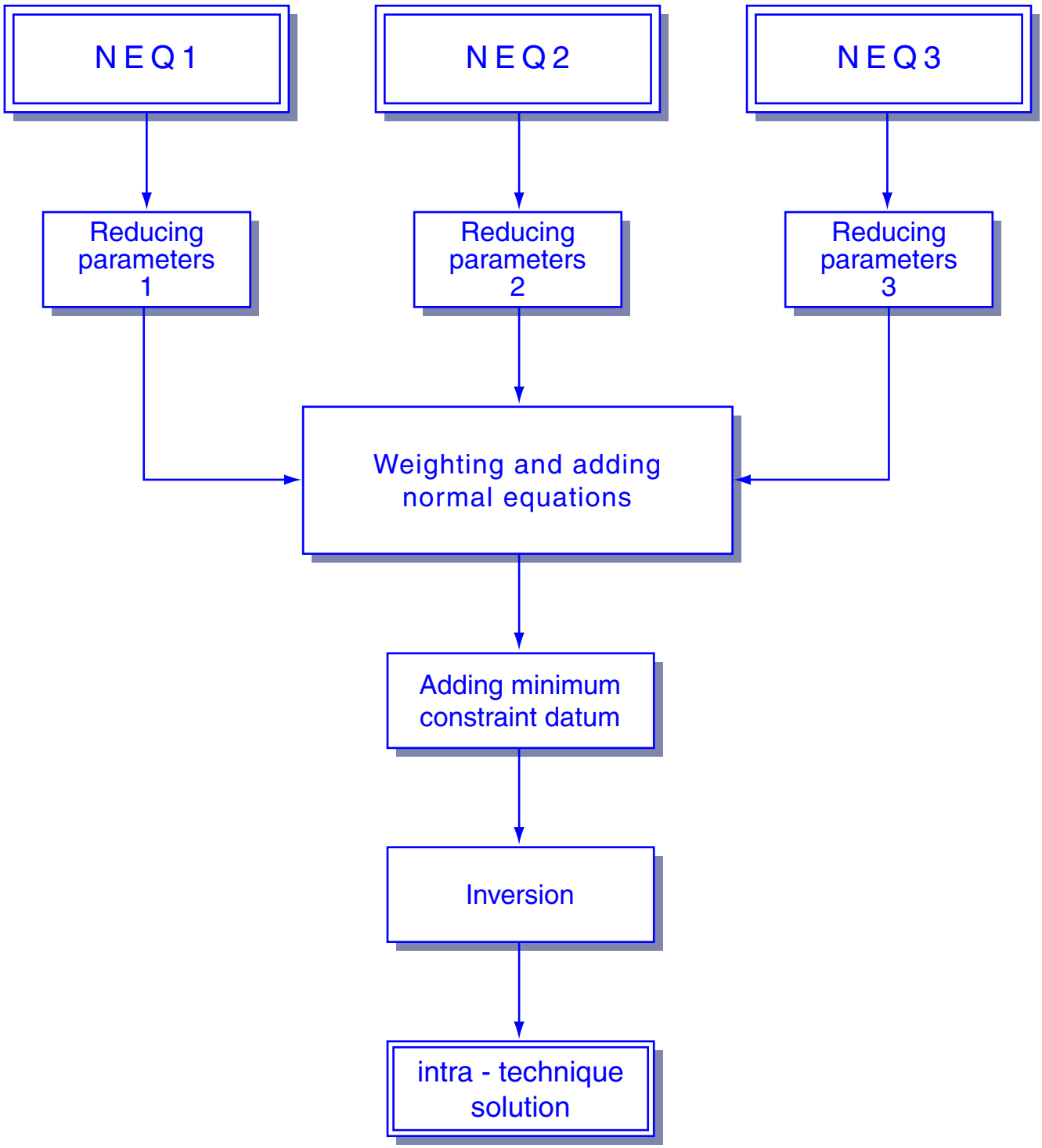
Intra - technique Combination



Data Sets

Solution	*Data Span*	*Stations original*	*Stations included*	*Datum*	*Source*
(IGN)02D04	1993-2002	111	109	loose / free net.	CDDIS
(GRGS)00D01	1993-1998	70	69	minimum dat.	ITRF 2000

Helmert-Transformation on ITRF 2000

Positions:

	IGN	*GRGS*
Tx [cm]	-1,14	1,57
Ty [cm]	0,0	0,47
Tz [cm]	-1,86	-8,49
Sc [ppm]	-0,0038 ≙ -2,44 cm	0,007 ≙ 4,5 cm

Velocities:

	IGN	*GRGS*
Tx [cm]	-0,01	-0,06
Ty [cm]	-0,12	-0,09
Tz [cm]	0,11	-0,15
Sc [ppm]	0,00	0,00029 ≙ 0,18 cm

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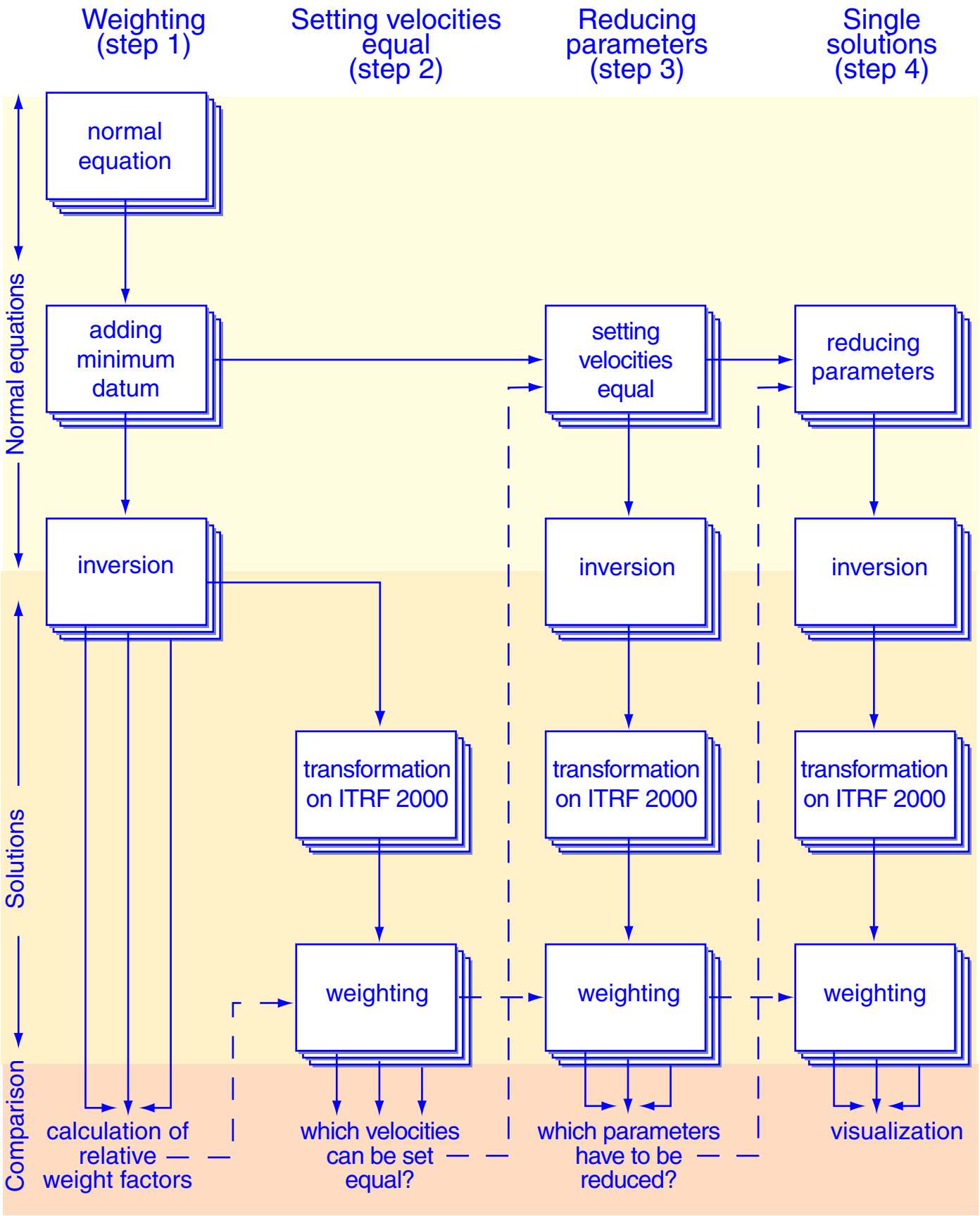
Intra - technique Comparison



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Datum definition

- Minimum constraints
  - No net rotation and no net translation conditions
  - On station coordinates and velocities
  - Depending on the degrees of freedom of the normal equation

- A subset of good stations was used to define the datum conditions

- The condition equations were added as pseudo observations to the normal equations.

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Weighting

- The niveau of the standard deviations might be (slightly) different for the individual solutions (e.g. due to different weighting models, model deficiencies, ...)

- To make sure that a single solution does not dominate the intra-technique combined solution it is essential to calibrate them against each other

- We compute for each single solution mean standard deviations for the positions by using a subset of good stations and use the resulting numbers for the computation of relative scaling factors.

Relative Weights

	σ^2
GRGS	1,0
IGN	0,2

Setting velocities equal

- On sites where more than one station of the same technique has observed, the velocity estimates should be identical, if the site motions are identical and systematic effects negligible.
- In reality these assumptions are not fulfilled for a number of sites (e.g. due to earthquakes, changes in instrumentation, ...)
- Therefore the velocities of different occupations should not automatically be identical.
- We use the ratios of the difference in velocities divided by the corresponding standard deviations to decide whether velocites should be set equal or not.

Occupations			Site	IGN		
				$\triangle_{vel}$	σ_{vel}	$\triangle/\sigma$
10003S001	/	S003	Toulouse, France	3.8	2.0	1.9
10202S001	/	S002	Reykjawik, Island	11.3	1.3	8.4
10317S002	/	S004	Ny Alesund, Norway	15.5	1.3	11.8
10503S013	/	S015	Metsahovi, Finland	27.7	4.9	5.6
12334S004	/	S005	Kitab, Uzbekistan	6.3	2.2	2.9
12334S004	/	S006	Kitab, Uzbekistan	27.2	5.9	4.6
23101S001	/	S002	Cibinong, Indonesia	22.4	4.5	5.0
30302S005	/	S006	Hartebeesthoek, S. Africa	13.7	3.7	3.7
30302S005	/	S002	Hartebeesthoek, S. Africa	14.3	3.5	4.1
30313S001	/	S002	Marion Island, S. Africa	13.8	2.9	4.7
30604S001	/	S002	Tristan da Cunha, UK	28.9	15.2	1.9
30606S002	/	S003	Sainte Helene, UK	15.6	2.8	5.6
31906S001	/	S002	Ponta Delgada, Portugal	36.2	9.7	3.7
32809S002	/	S003	Libreville, Gabun	10.7	2.2	5.0
39901S002	/	S003	Djibouti, Djibouti	14.9	3.1	4.7
40102S009	/	S011	Ontarion, Canada	10.1	2.9	3.5
40127S007	/	S008	Yellowknife, Canada	22.6	5.8	3.9
40405S005	/	S035	Goldstone, USA	29.2	7.4	3.9
40405S005	/	S037	Goldstone, USA	5.7	3.5	1.6
40408S004	/	S005	Fairbanks, USA	8.9	1.7	5.4
40503S003	/S004(1)		Socorro Island, Mexico	69.1	158.6	0.4
40503S003	/S004(2)		Socorro Island, Mexico	80.2	206.4	3.9
41507S003	/	S004	Rio Grande, Argentina	8.8	3.2	2.7
41507S003	/	S005	Rio Grande, Argentina	21.1	4.5	4.7
41703S008	/	S009	Easter Island, Chile	17.9	11.0	1.6
41705S007	/	S008	Santiago, Chile	31.7	3.1	10.2
41705S007	/	S009	Santiago, Chile	73.7	7.5	9.8
42202S005(1)/		S006	Arequipa, Peru	219.4	39.8	5.5
42202S005(2)/		S006	Arequipa, Peru	196.6	46.7	4.2
50103S201	/	S202	Canberra, Australia	47.2	9.2	5.1
50107S006	/	S010	Canberra, Australia	9.3	2.0	4.5
51101S001	/	S002	Port Moresby, Papua N.	56.4	25.6	2.2
66006S001	/	S003	Syowa, Antartica	17.9	1.3	13.9
91201S002	/	S003	Kerguelen, Kerguelen Isl.	7.1	3.8	1.9
91201S002	/	S004	Kerguelen, Kerguelen Isl.	25.3	5.3	4.7
91401S002	/	S003	Amsterdam, Amsterdam Isl.	33.1	4.8	6.8
91501S002	/	S002	Ile de Petrels, Terre Adelie	273.9	130.9	2.1
92201S007	/	S008	Pamatai, Tahiti	15.6	3.8	4.1
92701S001	/	S002	Noumea, New Caledonia	94.6	25.2	3.8
97401S001	/	S002	La Reunion, Reunion	10.1	1.7	5.9

Tab. 1 : *Equating DORIS velocities.*

Reducing parameters

- Descrepancies in the station coordinates or velocities between different (single-) solutions can lead to deformations in the combined intra-technique network.
- Therefore it is essential to identify possible outliers in the individual solutions.
- We implemented an iterative method for the outlier detection.
- Criteria are the absolute difference of a parameter in a single solution with respect to the other solutions and the ratio of this difference devided by the corresponding standard deviation.

Recommendations

- Report constraints in SINEX files (SOLUTION / MATRIX-APRIORI or SOLUTION/APRIORI) and/or submit unconstrained normal equations
- Define a subset of DORIS "core stations" that can be used for datum defintion, transformation, etc.
- Velocities of different occupations at the same site should not be set equal
- Reference list for DORIS site information (domes number, 4-char-ID, epochs, solution numbers, ...)
- Report solution statistics block (degrees of freedom, ...) in SINEX files

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