



Assessment of sea level in the coastal zone

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**National
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NATURAL ENVIRONMENT RESEARCH COUNCIL

Goal

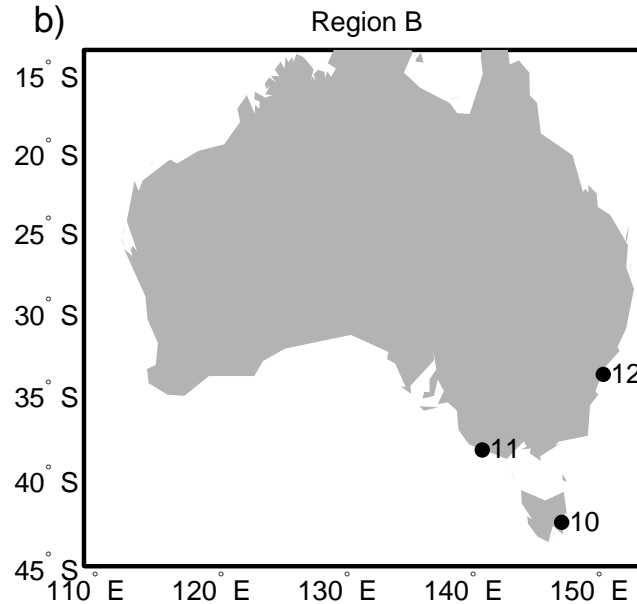
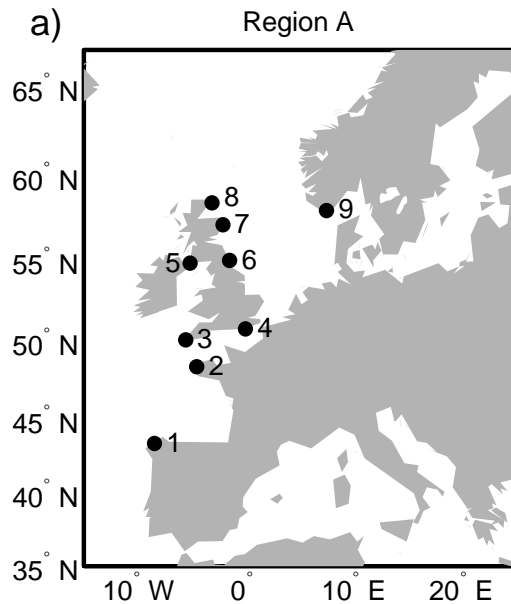


- **Validate altimetry data from the SLCCI project against tide gauge data**
 - Seasonal cycle, inter-annual variability and long-term trend.
- **Investigate relative sea level using a combination of altimetry and tide gauge data**
 - Assess the feasibility of deriving the rate of VLM at tide gauge stations.
- **Investigate effects of choices for corrections and retrackers**

Data



- Tide gauge data are obtained from the BODC (15 min) and the UHSLC (60 min).
- Satellite altimetry data are from the gridded SLCCI product.
- The Dynamic Atmospheric Correction (DAC) from AVISO is applied to all tide gauge records.



#	Name	Region	Latitude	Longitude	Gaps (%)
1	La Coruña	A	43.4°N	8.4°W	4.5
2	Brest	A	48.4°N	4.5°W	1.9
3	Newlyn	A	50.1°N	5.5°W	4.9
4	Newhaven	A	50.8°N	0.1°E	4.2
5	Port Patrick	A	54.8°N	5.1°W	10.6
6	North Shields	A	55.0°N	1.4°W	2.7
7	Aberdeen	A	57.1°N	2.1°W	4.9
8	Wick	A	58.4°N	3.1°W	6.4
9	Tregde	A	58.0°N	7.6°E	0.8
10	Spring Bay	B	42.5°S	147.9°E	0.4
11	Portland	B	38.3°S	141.6°E	0.4
12	Fort Denison	B	33.9°S	151.2°E	0.8

Results – annual cycle



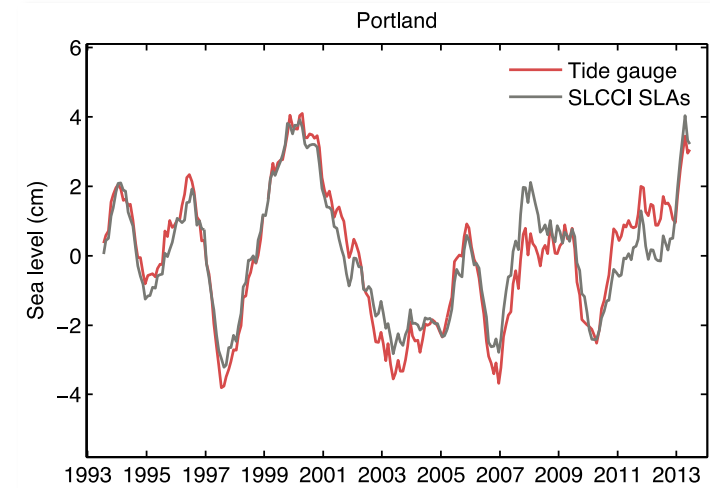
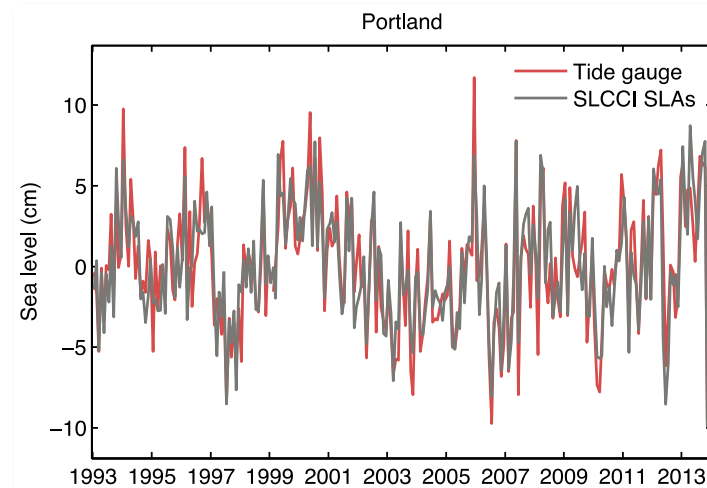
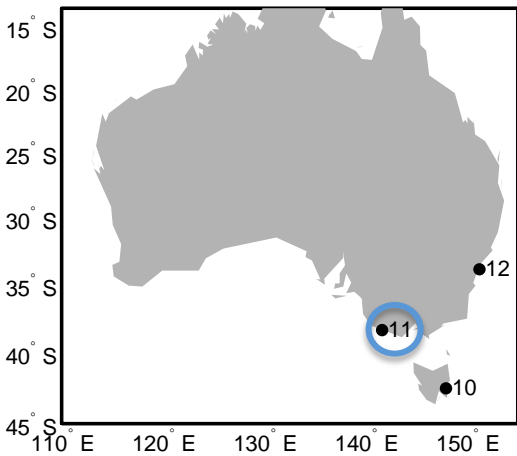
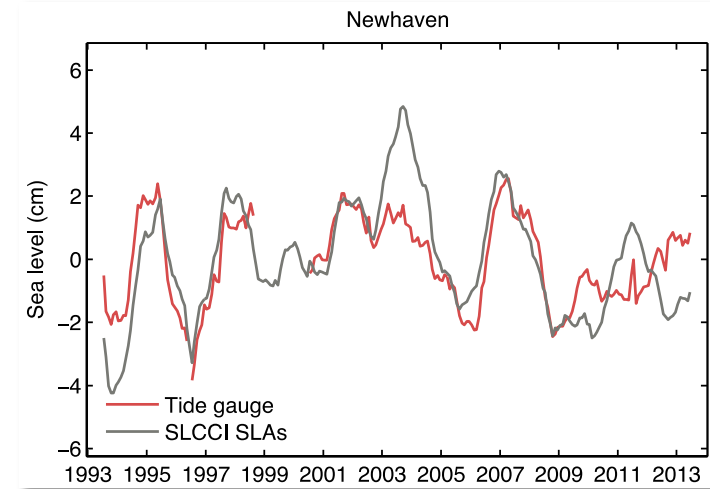
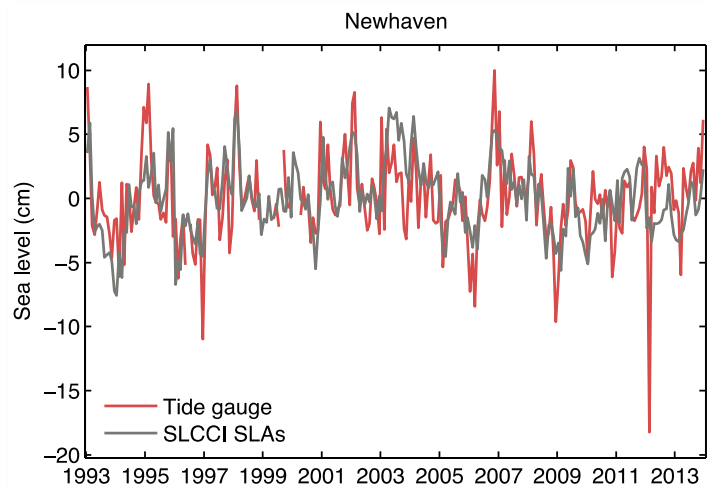
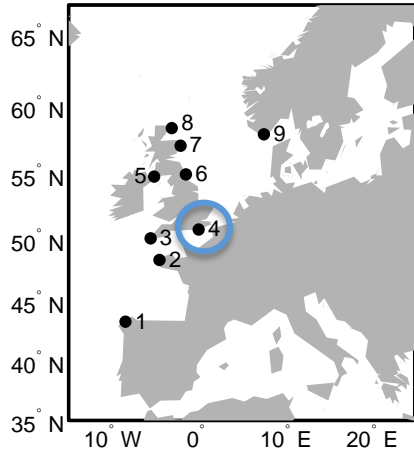
tg name	A_{tg} (cm)	A_{CCI} (cm)	f_{tg} (days)	f_{CCI} (days)
LaCoruna	5.1 ± 0.8	5.5 ± 0.5	334 ± 10	320 ± 6
Brest	5.5 ± 0.6	5.7 ± 0.4	331 ± 7	308 ± 4
Newlyn	5.4 ± 0.7	5.3 ± 0.6	304 ± 7	318 ± 6
Newhaven	6.2 ± 0.6	5.7 ± 0.5	304 ± 6	308 ± 5
Portpatrick	7.8 ± 0.9	6.6 ± 0.7	323 ± 6	320 ± 6
North Shields	6.2 ± 0.8	7.4 ± 0.7	307 ± 8	311 ± 5
Aberdeen	6.8 ± 0.8	7.6 ± 0.6	311 ± 7	313 ± 5
Wick	7.4 ± 0.9	8.0 ± 0.7	318 ± 7	319 ± 5
Tregde	6.9 ± 0.6	6.8 ± 0.6	304 ± 5	309 ± 5
SpringBay	5.1 ± 0.5	6.3 ± 0.6	156 ± 5	161 ± 5
Portland	8.8 ± 0.6	8.1 ± 0.6	174 ± 4	170 ± 4
FortDenison(Sydney)	6.9 ± 0.6	5.3 ± 0.7	150 ± 5	134 ± 7

Results – inter-annual variability



Deseasoned

13-month running mean



Results – long-term trends



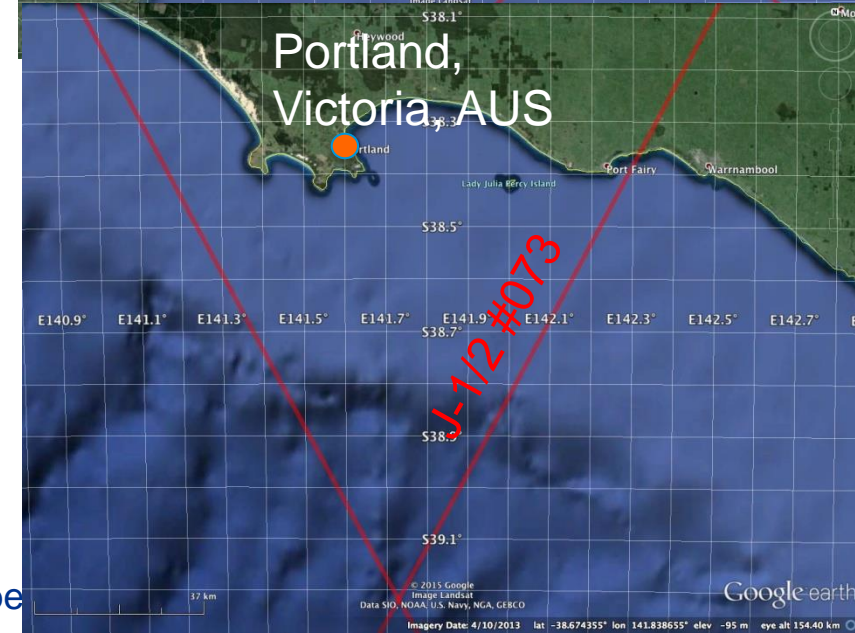
t : linear trend

	ρ		τ	τ			
LaCoruna	0.60	3.8	2.7 ± 1.7	2.0 ± 1.0	0.7 ± 1.2	2.4 ± 0.1	0.0
Brest	0.64	2.8	1.4 ± 1.0	1.6 ± 0.6	-0.2 ± 0.9	1.1 ± 0.1	0.2
Newlyn	0.63	3.0	2.7 ± 1.2	2.2 ± 1.0	0.5 ± 0.9	0.0 ± 0.1	0.3
Newhaven	0.54	3.0	1.3 ± 1.0	1.9 ± 1.1	-0.6 ± 0.9	0.89 ± 0.7	-0.1
Portpatrick	0.74	3.2	2.3 ± 1.3	1.5 ± 1.3	0.8 ± 0.9	n/a	-0.8
North Shields	0.71	3.3	2.4 ± 1.2	1.8 ± 1.2	0.6 ± 1.0	-0.7 ± 0.2	-0.4
Aberdeen	0.83	2.6	1.6 ± 1.4	1.5 ± 1.0	0.0 ± 0.9	-0.9 ± 0.1	-0.8
Wick	0.87	2.5	1.6 ± 1.6	1.4 ± 1.2	0.2 ± 0.8	n/a	-0.8
Tregde	0.69	2.9	0.7 ± 1.1	2.5 ± 1.0	-1.8 ± 0.6	-1.5 ± 0.2	-1.0
SpringBay	0.84	1.7	3.7 ± 0.7	3.4 ± 0.9	0.3 ± 0.4	n/a	-0.2
Portland	0.86	1.9	3.7 ± 1.1	3.8 ± 1.2	-0.1 ± 0.4	n/a	-0.2
FortDenison(Sydney)	0.57	3.5	3.3 ± 1.0	4.0 ± 1.2	-0.7 ± 1.0	n/a	-0.2

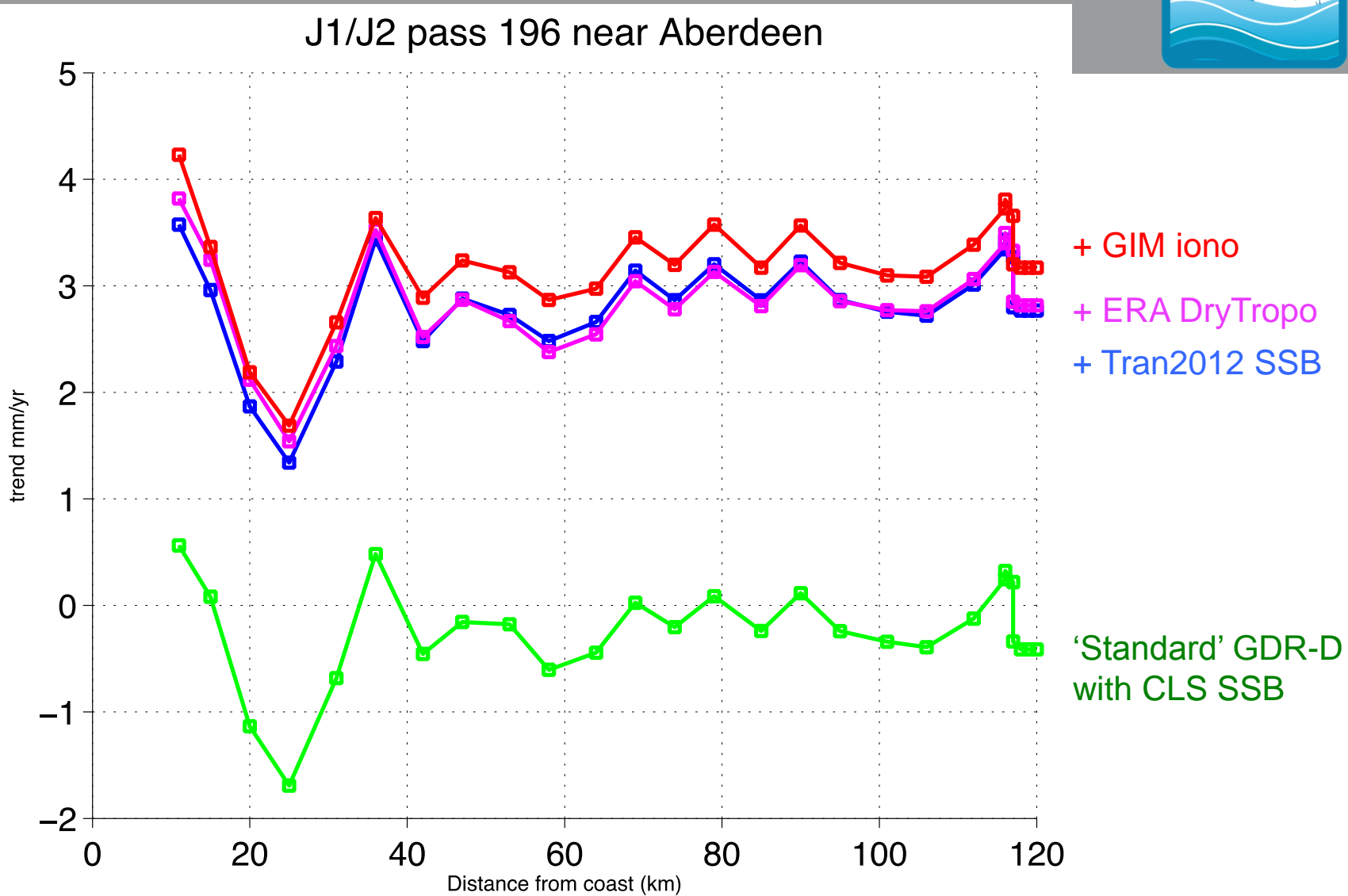
Impact of correction choices in coastal zone - examples



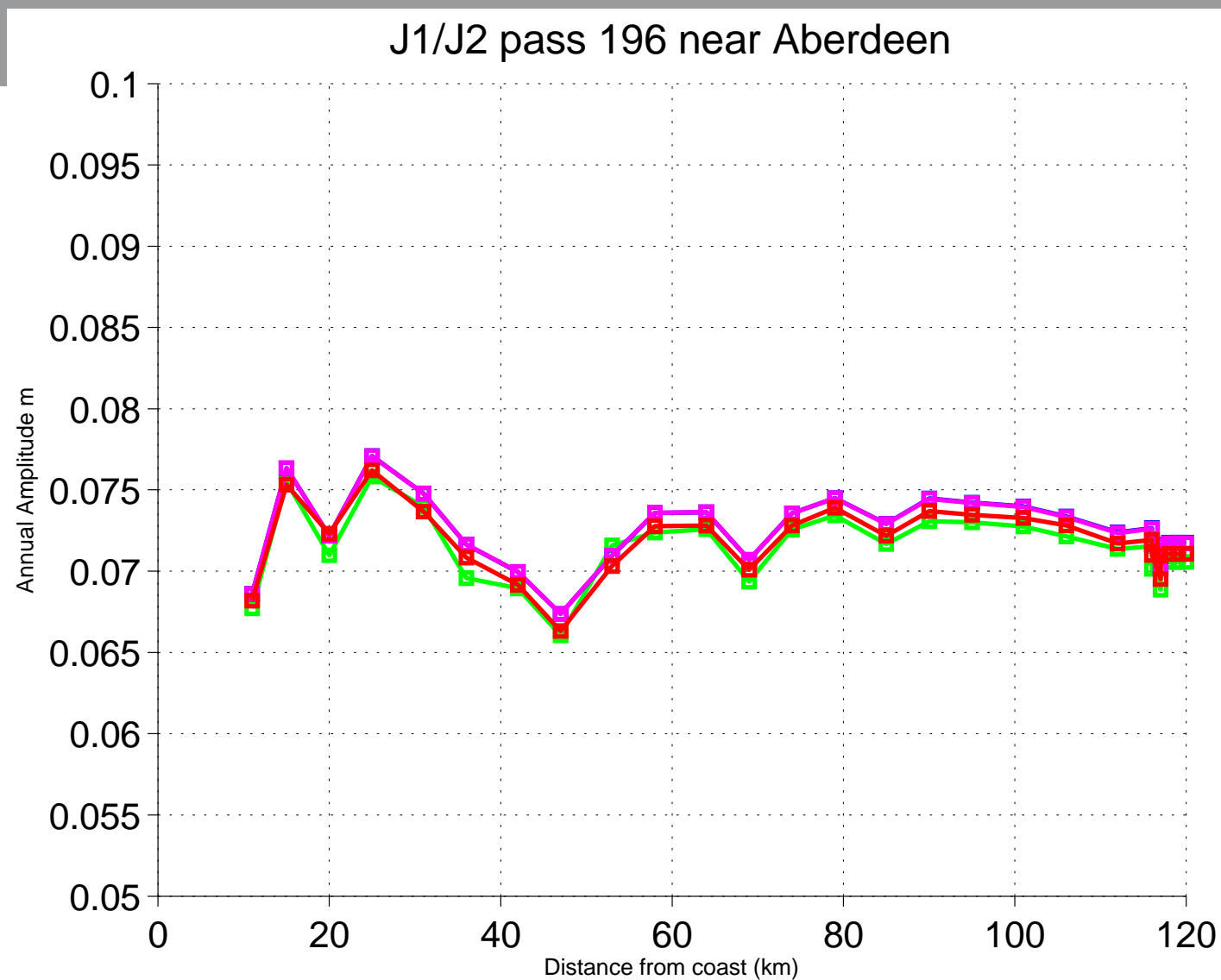
- **We have computed trends and seasonal signals with different choices**
 - impact or ERA dry tropo, 2012 SSB, GIM model
 - we used Newey-West regressions
- **Two examples in different hemispheres**



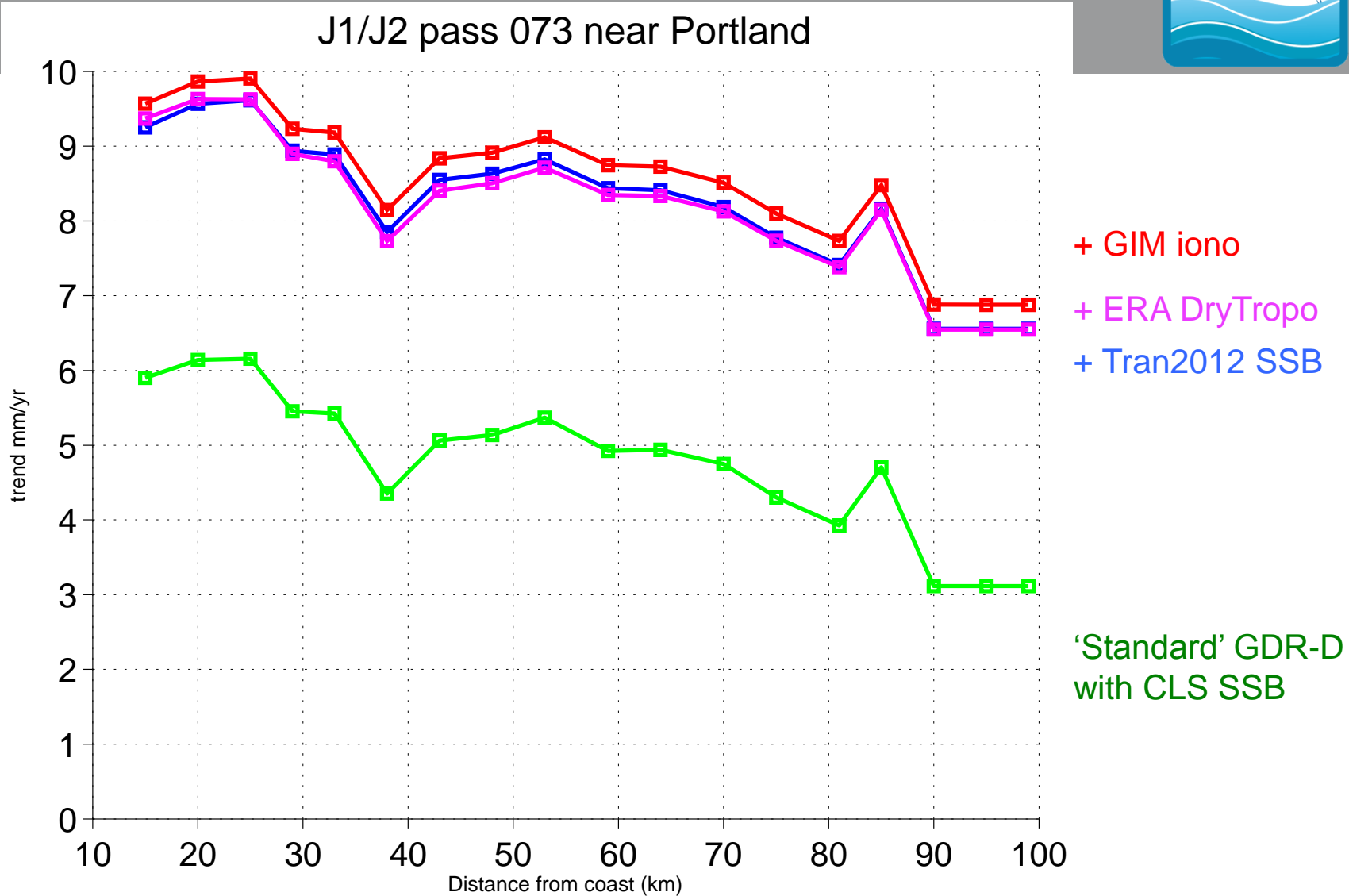
Trends - Aberdeen



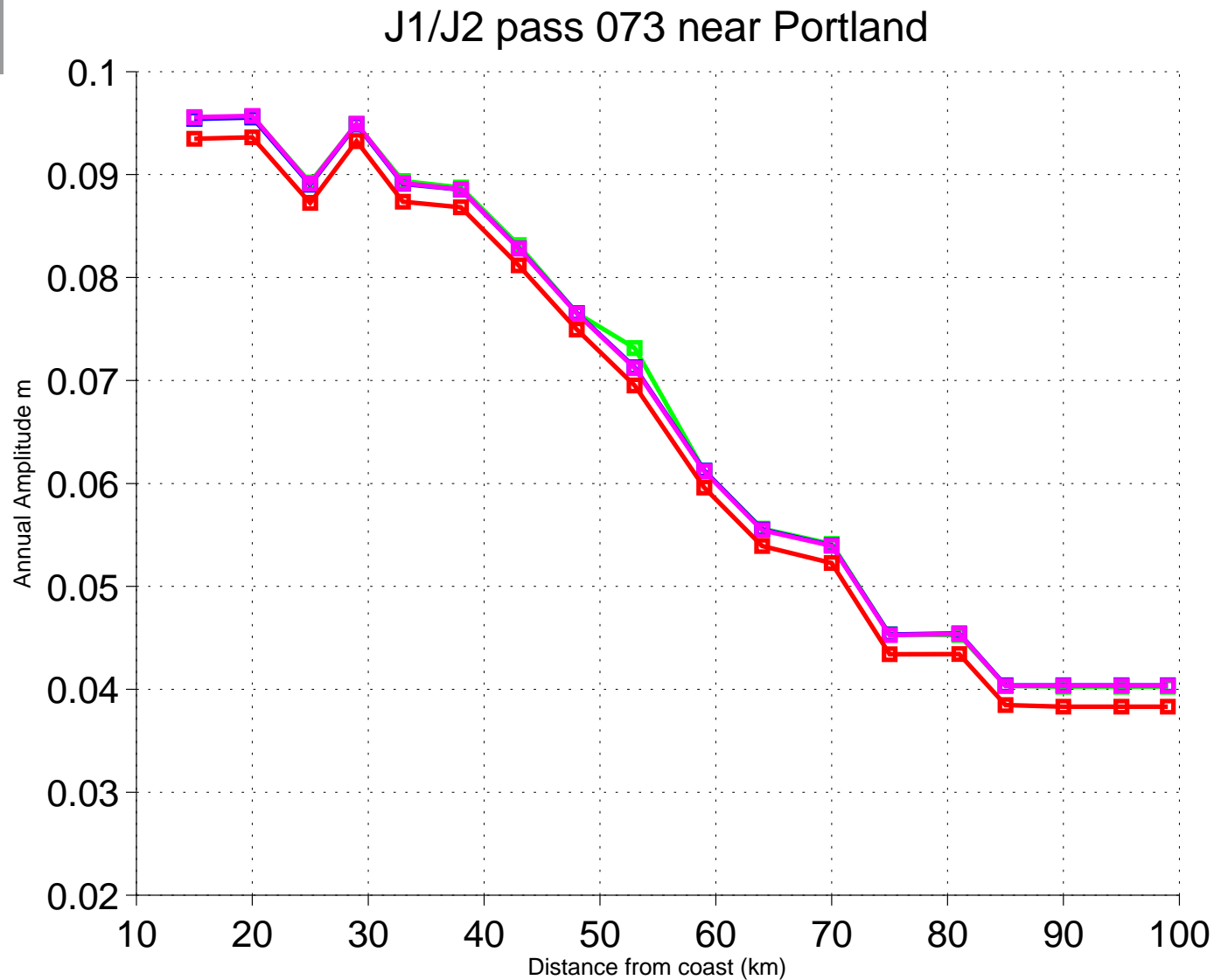
Amplitudes - Aberdeen



Trends - Portland



Amplitudes - Portland



+ GIM iono

+ ERA DryTropo

+ Tran2012 SSB

'Standard' GDR-D
with CLS SSB

Conclusions



- **Good agreement between tide gauges and SLCCI gridded products in terms of annual amplitude and phase. Differences are <1.6 cm and <23 days in all cases.**
- **For detrended and deseasoned time series, the correlation between SLCCI SLAs and tide gauge records is statistically significant at all stations, ranging from 0.54 to 0.87.**
- **Altimetry and tide gauge trends are not statistically different at any station (due to large uncertainty in the estimates).**
- **Large uncertainty in the trend estimates impacts on computation of VLM rates from tide gauge and altimetry data (Task 2330).**
- **Ongoing work on the corrections points at some significant impact of the choices in the coastal zone, which needs to be investigated further and combined with specialized retrackerers.**