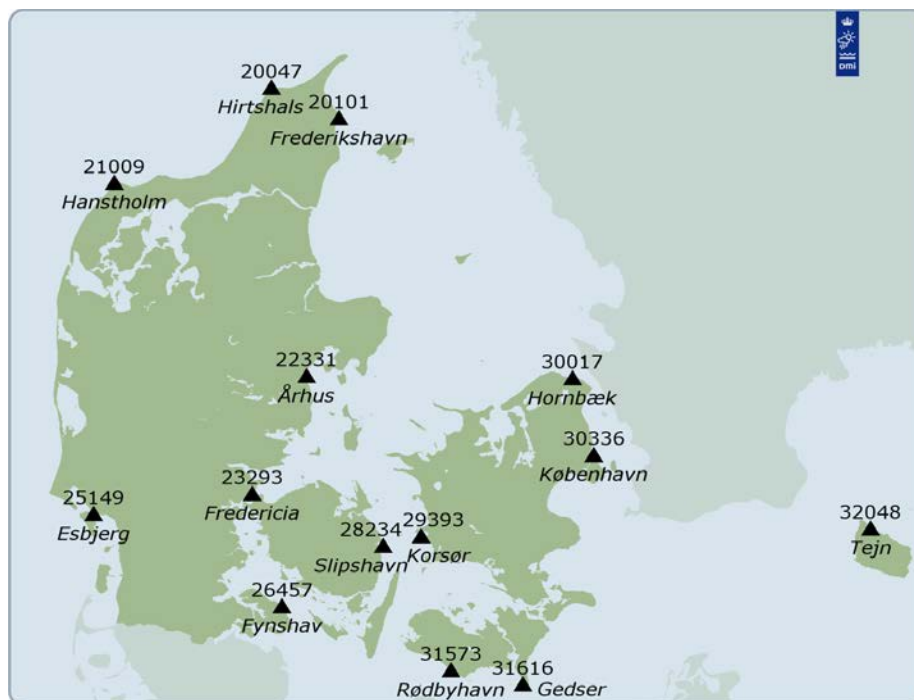# DMI

Danish Ministry of Climate, Energy and Building

Technical Report 13-15

Sea level data 1889 - 2012 from 14 stations in Denmark

Mean, maximum and minimum values calculated on monthly and yearly basis including plots of mean values

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Copenhagen 2013

Content

1. Abstract

This report present sea level data 1889 - 2012 as means and maximum and minimum values calculated on a monthly and yearly basis from 14 stations in Denmark. These data are attached in two files named month.csv and year.csv and described in chapter 4.

This report also presents plots of mean values on a monthly and yearly basis from these 14 sea level stations and each plot include trend/year and summarized trend during the timespan.

2. Introduction

In the end of the 19.th century DMI established 10 sea level stations scattered along the coast of Denmark. During the 20.th century 5 stations were added and in the 21.st century additional stations were established or transferred from Danish Marine Society Administration.

Stations with more than 20 years of data are shown in the map below and data from these stations are presented in this report.
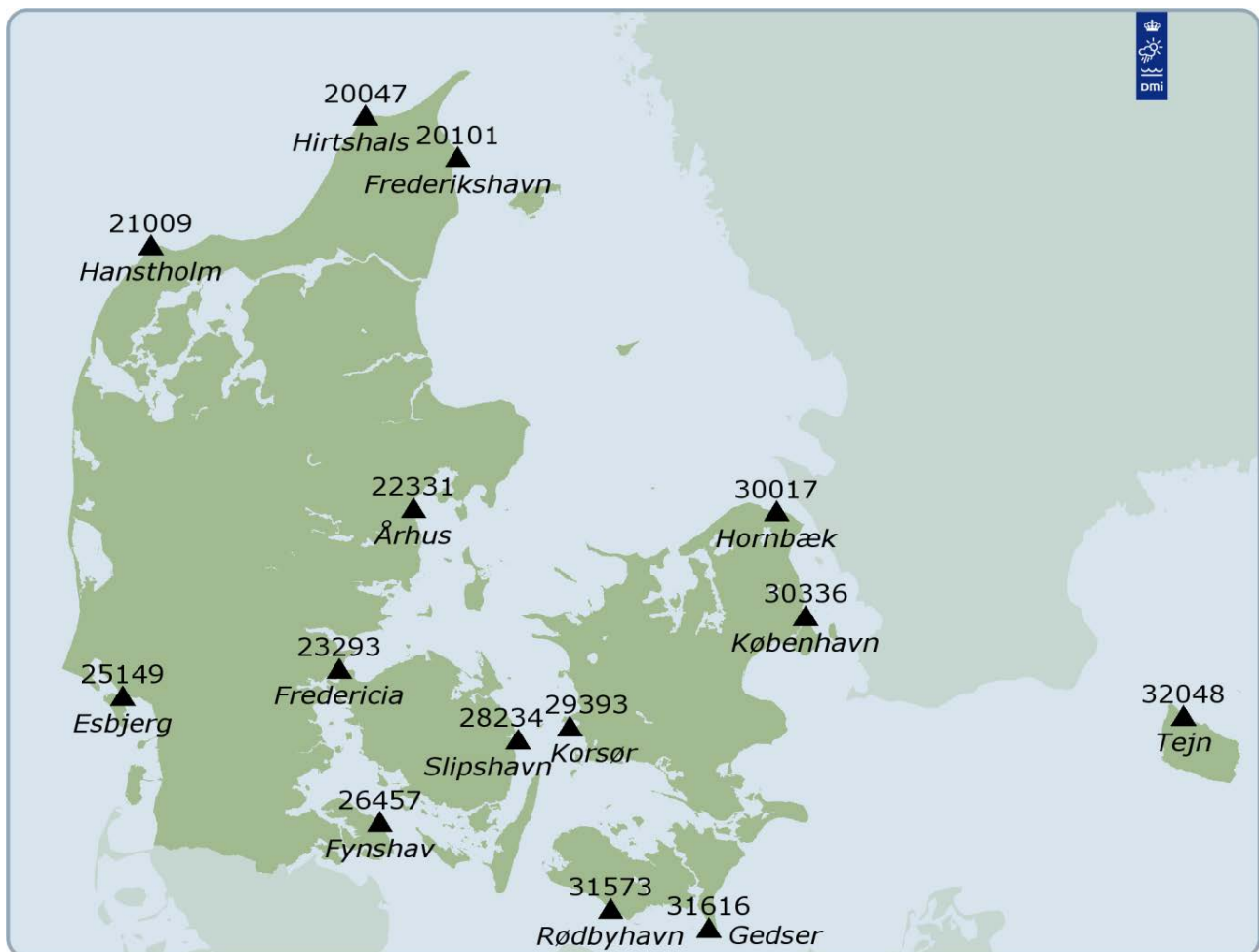
Map of sea level stations

3. Data

Data from Esbjerg, Gedser and Hornbæk are stored in DMI's database from establishments approx. 1890.

Data from the other 11 stations are stored in DMI's database from approx. 1970. Regarding data before 1970, mean, maximum and minimum values on a monthly and yearly basis have been maintained in flat files by previous staff. However no explanations or indications regarding number of observation used for calculations or eliminations exists.

Up till approx. 1970 data were collected on an hourly basis – 00:00, 01:00, 02:00 ….. 23:00. – Since then data have been collected every 15 minute and later on every 10 minute but for the sake of homogeneity only data with hourly timestamp are used.

Datum

All data are converted to datum = LN, where LN is local zero, which is the originally established mean sea level (MSL) for the station.

Conversion from LN to DVR (Danish Vertical Reference) is outlined for each station on the following data sheets.

Data processing

Data are converted to datum with no further processing. No corrections are made due to changes in meteorology, oceanography, geology/geodesy and climatology on local, regional or global scale, potential anthropogenic effects on local scale and changes in instruments and/or measurement methods, position, harbor construction etc. etc.

Mean is calculated as simple average (arithmetic mean).
Maximum is largest value.
Minimum is smallest value.
Number of observations is the number of observations used for calculations of mean, maximum and minimum.

Units

All measures of the sea level are in cm. and therefore data are presented in cm.

Meta data

Positions as latitude and longitude in WGS84 and as coordinates in UTM ED50 are outlined for each station on the following data sheets.

Presentation

Means with more than 90 % data (number of observations – if available) are plotted below on monthly and yearly basis, respectively. Trend/year and summarized trend during the timespan is calculated and included in each plot.

Hirtshals – 20047

Position	WGS84		UTM (m) – ED50		
	Latitude	Longitude	Zone	Northing	Easting
From					
01-01-1891	57° 35,6'	9° 57,5'	32V	6384044	557410
18-12-1952	57° 35,7'	9° 57,8'	32V	6384248	557615

Monthly mean sea level (MSL) relative to datum
Hirtshals - 20047

Trend = -0,03 cm./year equal to -3,2 cm. in 122 years

Yearly mean sea level (MSL) relative to datum
Hirtshals - 20047

Trend = -0,02 cm./year equal to -3,0 cm. in 122 years
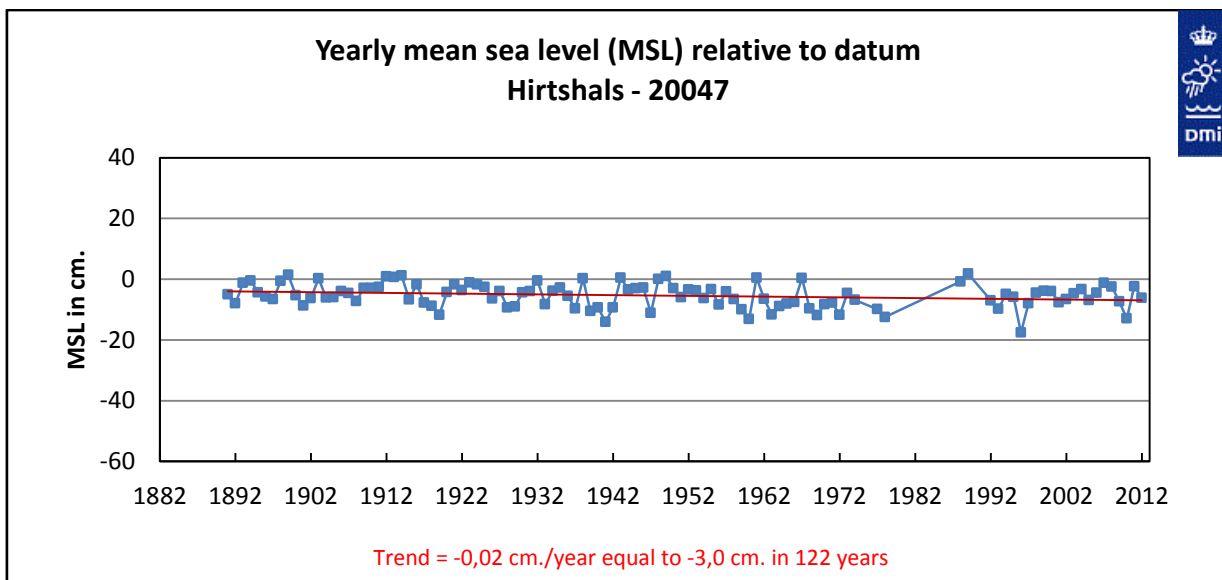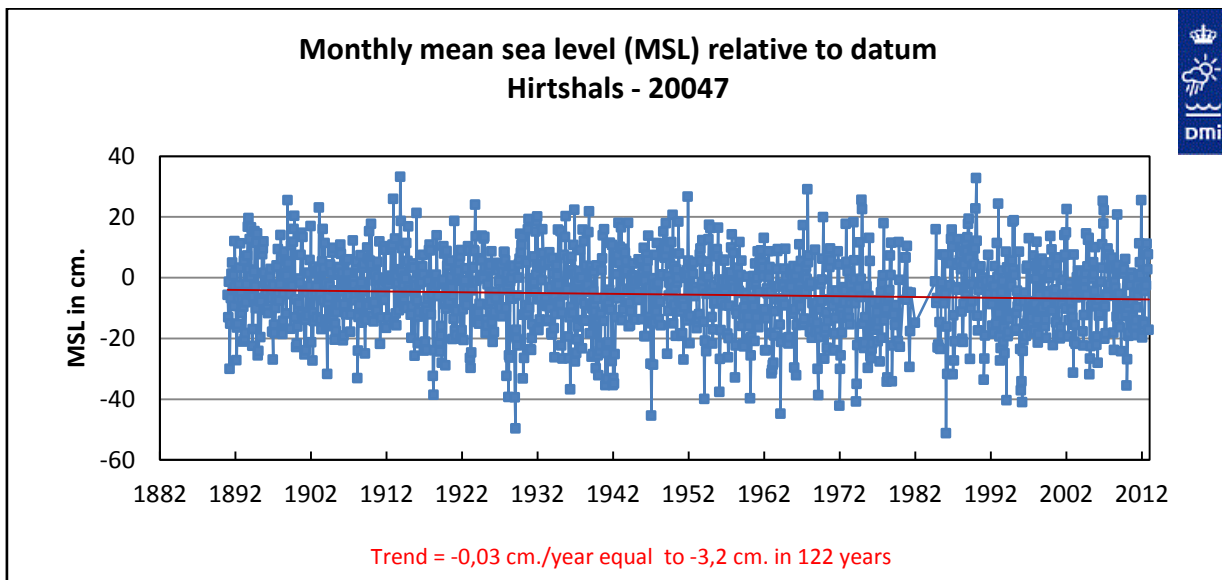
Datum	DVR - LN
Offset in cm.	-1

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Frederikshavn – 20101

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1893	57° 26'	10° 33,2'	32V	6366897	593309
13-06-1957	57° 26,1'	10° 32,6'	32V	6367071	592776
14-01-1970	57° 26,1'	10° 32,7'	32V	6367088	592839
02-12-1977	57° 26,2'	10° 33,1'	32V	6367233	593250
01-10-1987	57° 26,2'	10° 32,9'	32V	6367168	592985
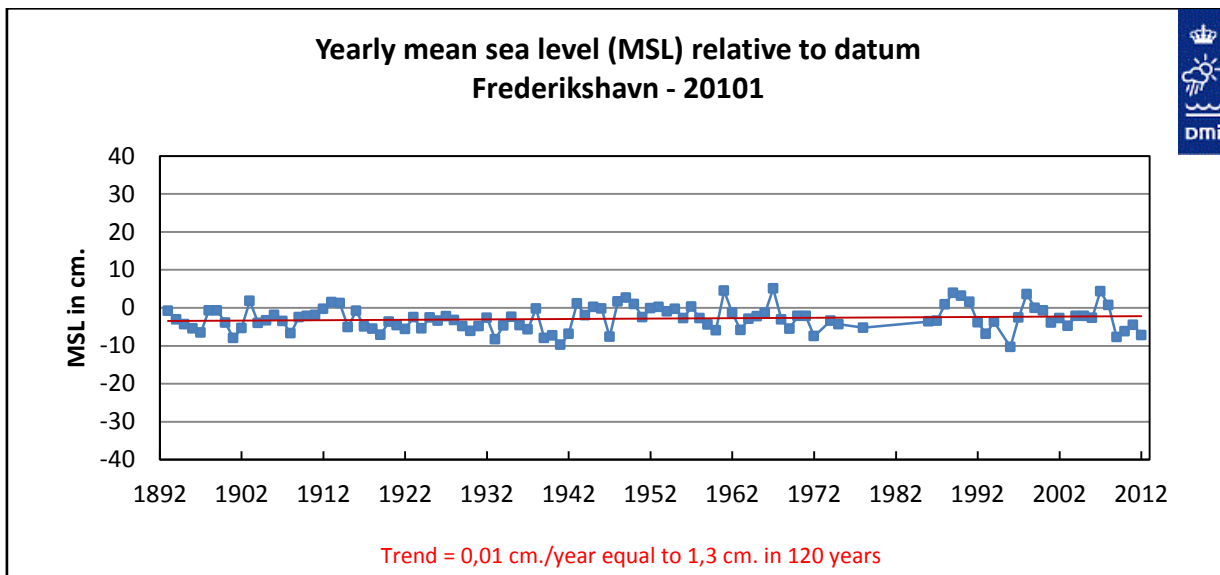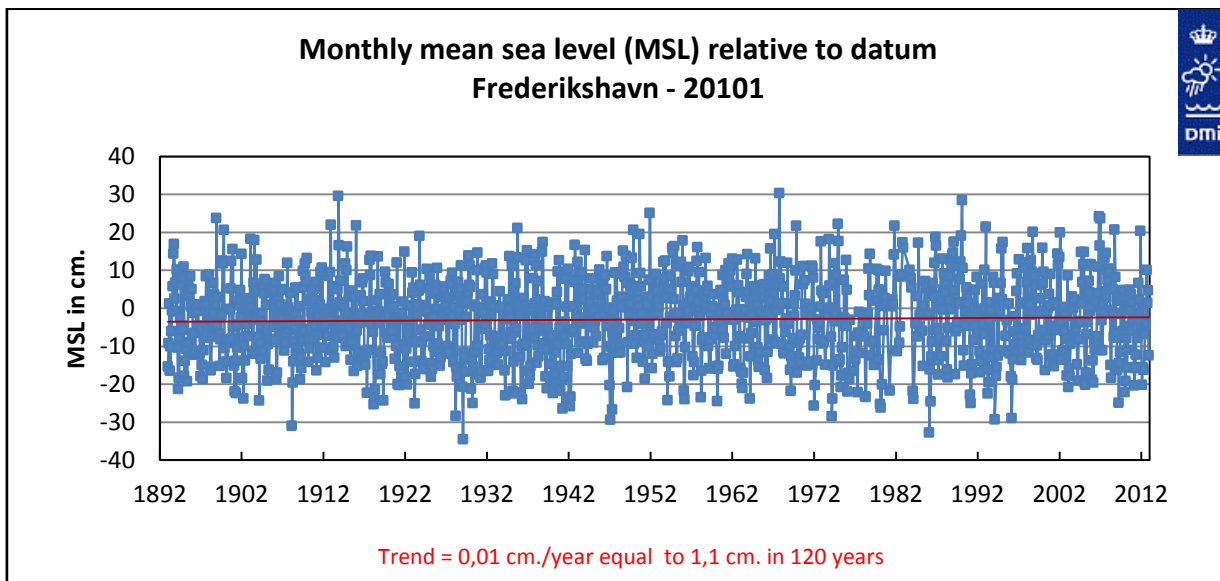
Monthly mean sea level (MSL) relative to datum
Frederikshavn - 20101

Trend = 0,01 cm./year equal to 1,1 cm. in 120 years

Yearly mean sea level (MSL) relative to datum
Frederikshavn - 20101

Trend = 0,01 cm./year equal to 1,3 cm. in 120 years

Datum	DVR - LN
Offset in cm.	-3

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Hanstholm – 20047

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1969	57° 7,3'	8° 36,1'	32V	6331200	475950
21-09-1989	57° 7,1'	8° 35,7'	32V	6330824	475514

Monthly mean sea level (MSL) relative to datum
Hanstholm - 21009

Trend = 0,23 cm./year equal to 10,0 cm. in 44 years

Yearly mean sea level (MSL) relative to datum
Hanstholm - 21009

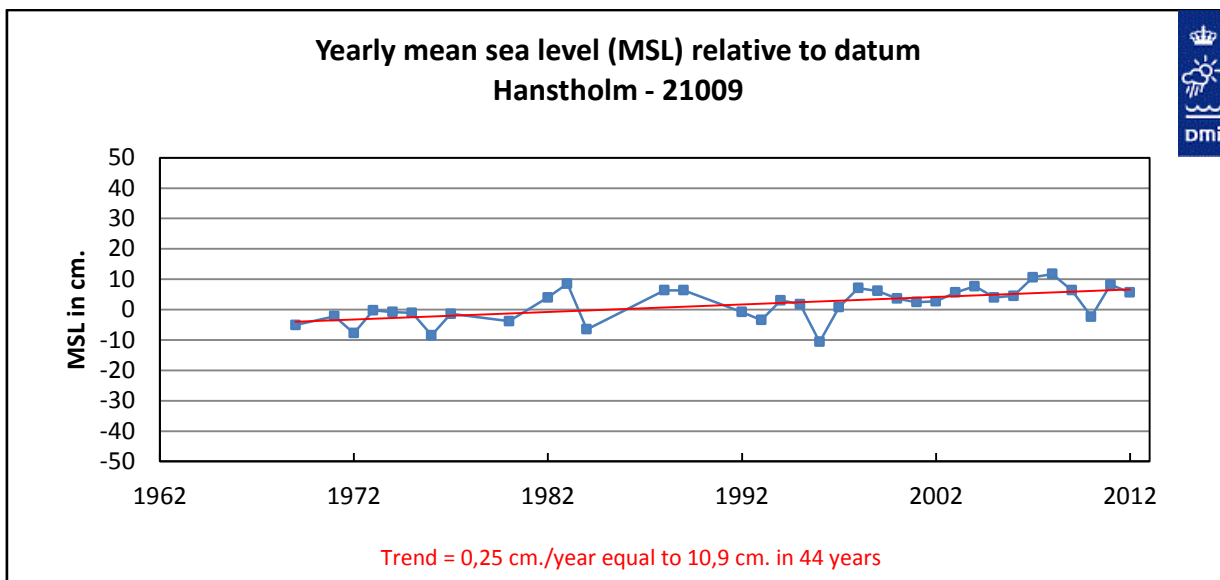Trend = 0,25 cm./year equal to 10,9 cm. in 44 years

Datum	DVR - LN
Offset in cm.	-4

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Århus – 22331

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1890	56° 9,5'	10° 13'	32V	6224532	575678
16-06-1938	56° 10,2'	10° 13,4'	32V	6225799	576057
08-07-1992	56° 8,8'	10° 13,4'	32V	6223284	576039

Monthly mean sea level (MSL) relative to datum
Århus - 32331

Trend = 0,06 cm./year equal to 7,8 cm. in 123 years

Yearly mean sea level (MSL) relative to datum
Århus - 22331

Trend = 0,07 cm./year equal to 8,1 cm. in 123 years

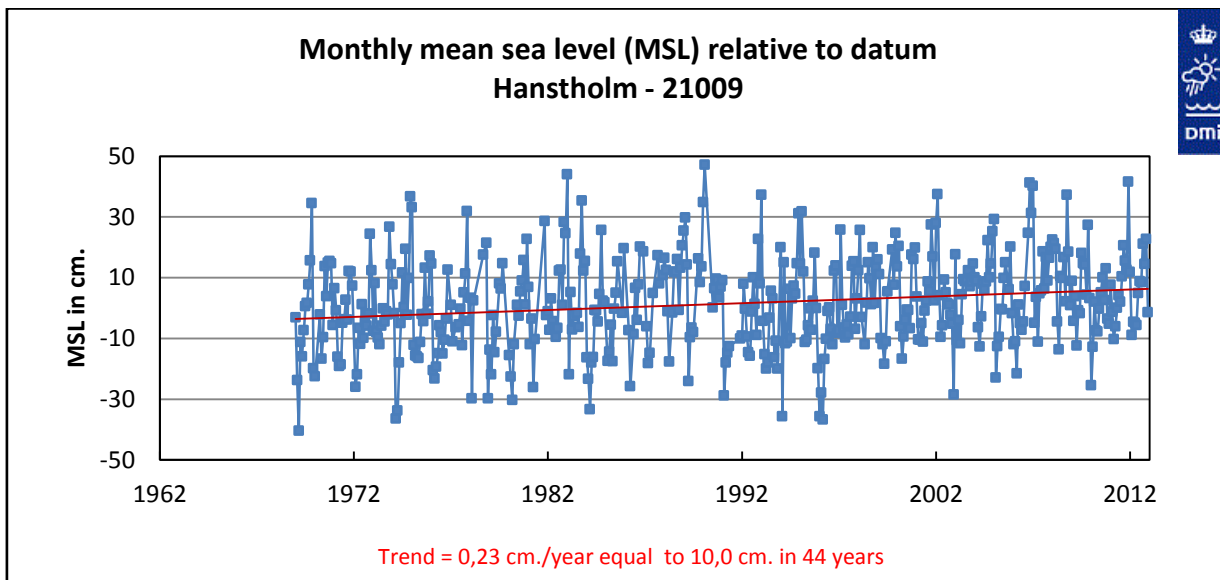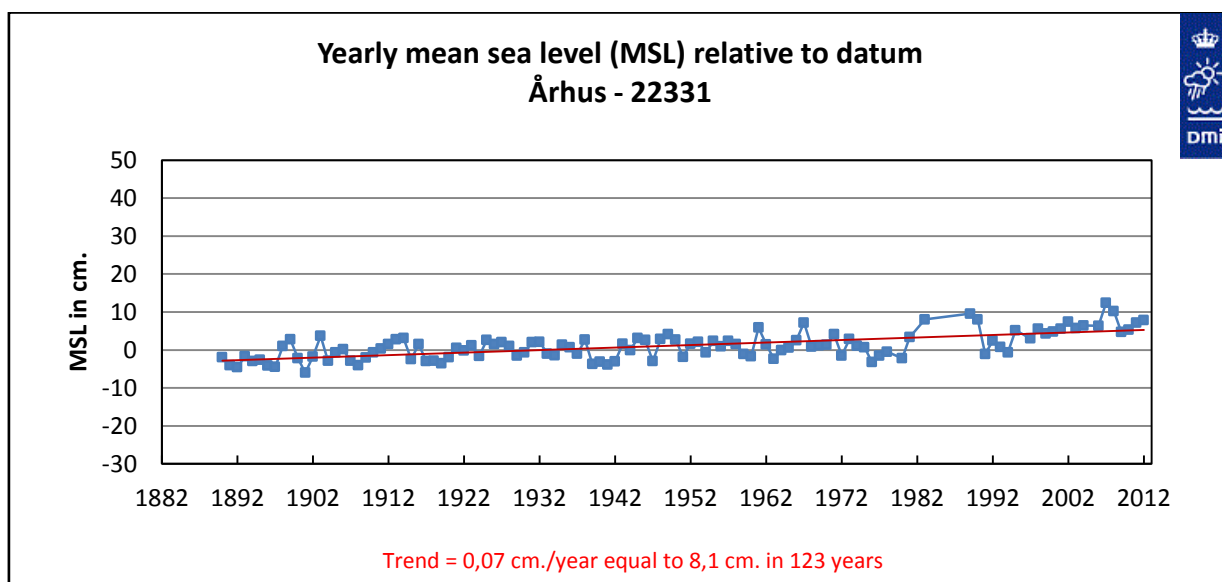| Datum	DVR - LN
Offset in cm.	-3

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Fredericia – 23293

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1890	55° 33,6'	9° 45,2'	32U	6157593	547587

Monthly mean sea level (MSL) relative to datum
Fredericia - 23293

Trend = 0,11 cm./year equal to 13,7 cm. in 123 years

Yearly mean sea level (MSL) relative to datum
Fredericia - 23293

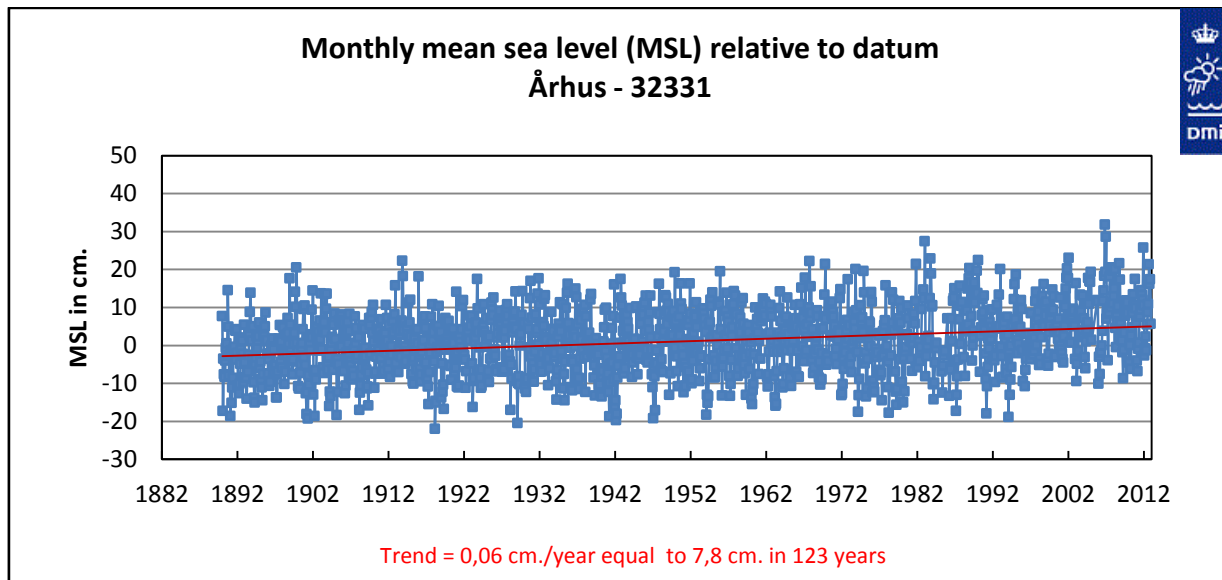Trend = 0,11 cm./year equal to 13,6 cm. in 123 years

Datum	DVR - LN
Offset in cm.	-9

LN is local zero, which is the originally established mean sea level (MSL) for the station
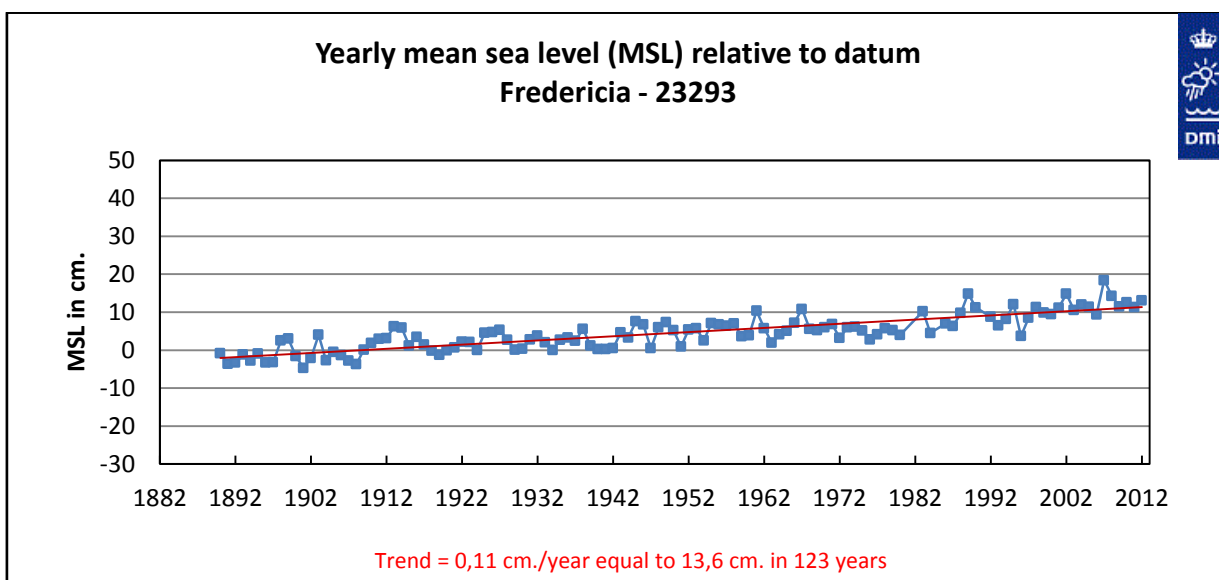
DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Esbjerg – 25149

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1889	55° 27,6'	8° 26,4'	32U	6146350	464650

Monthly mean sea level (MSL) relative to datum
Esbjerg - 25149

Trend = 0,13 cm./year equal to 15,6 cm. in 124 years

Yearly mean sea level (MSL) relative to datum
Esbjerg - 25149

Trend = 0,12 cm./year equal to 15,3 cm. in 124 years

Datum	DVR - LN
Offset in cm.	-11

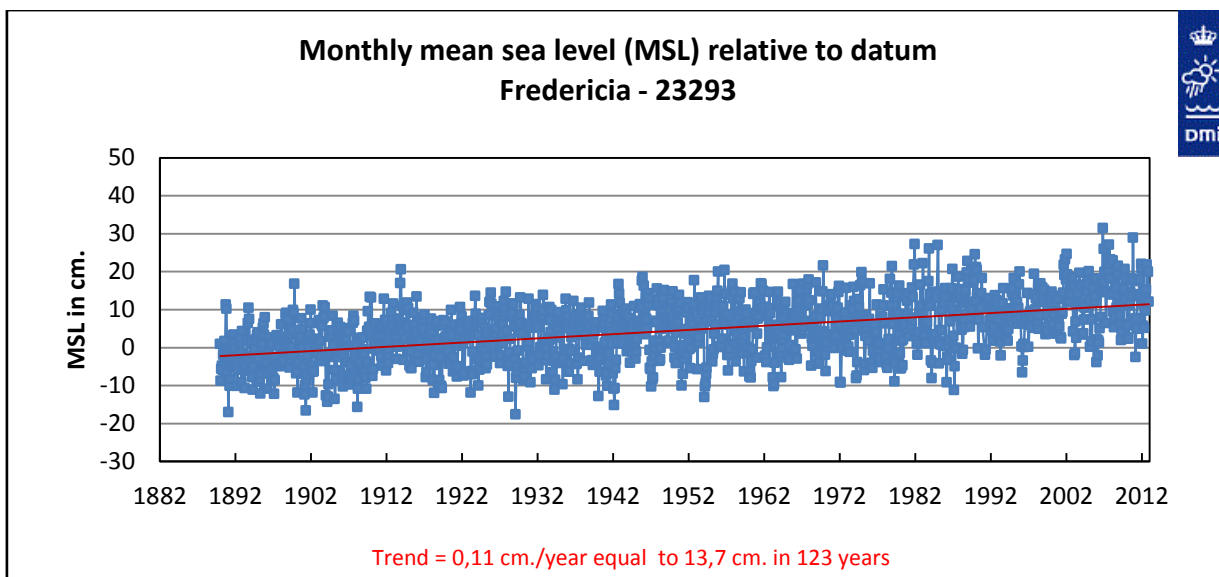LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset
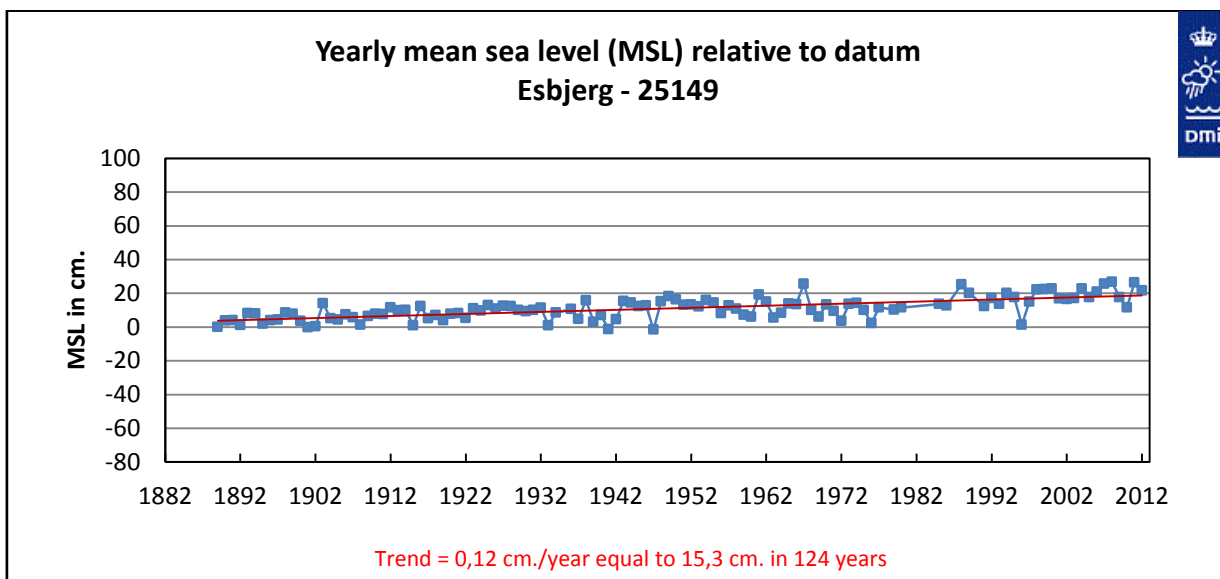
Fynshav – 26457

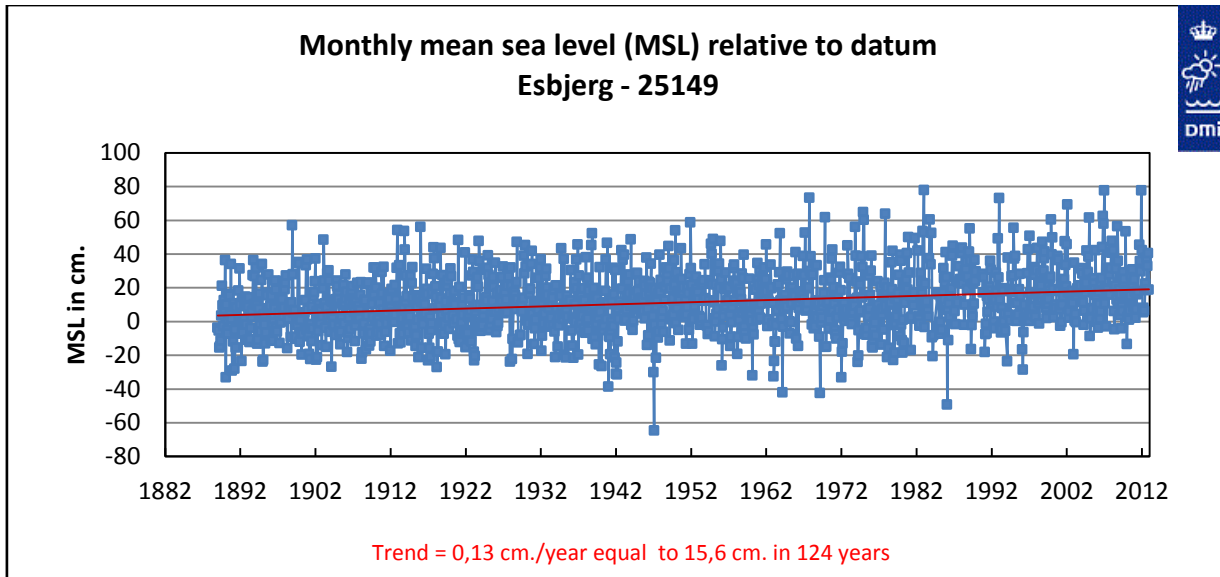| Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1970	54° 59,7'	9° 59,1'	32U	6094855	563096
29-10-1991	54° 59,7'	9° 59,1'	32U	6094848	563106
29-09-2010	54° 59,7'	9° 59,1'	32U	6094818	563138

Monthly mean sea level (MSL) relative to datum
Fynshav - 26457

Trend = 0,24 cm./year equal to 10,2 cm. in 43 years

Yearly mean sea level (MSL) relative to datum
Fynshav - 26457

Trend = 0,23 cm./year equal to 9,7 cm. in 43 years

Datum	DVR - LN
Offset in cm.	-17

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

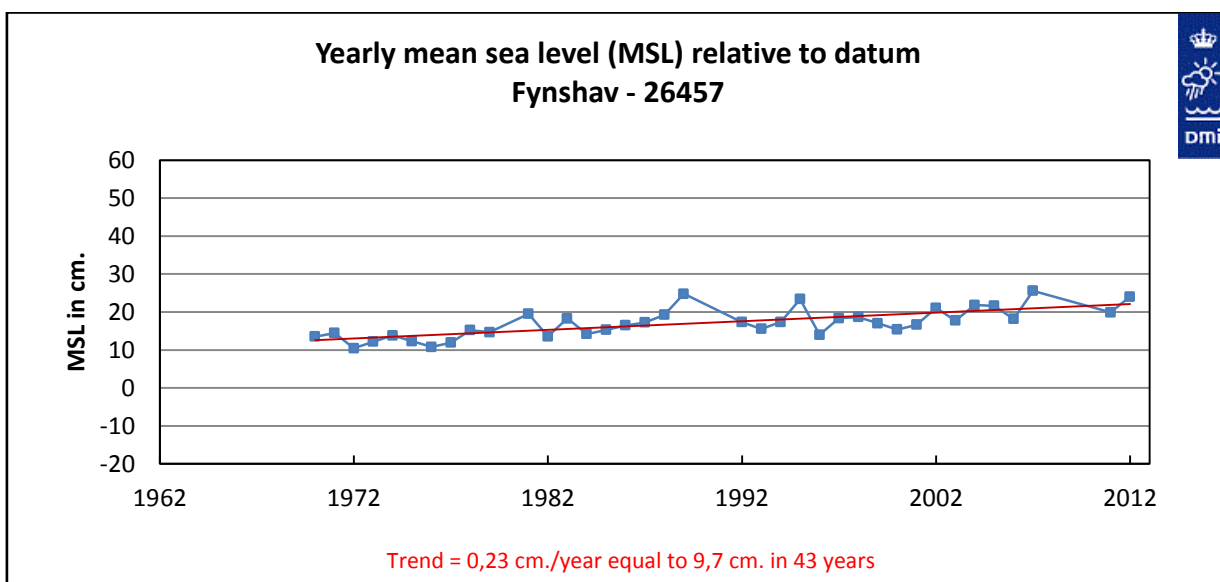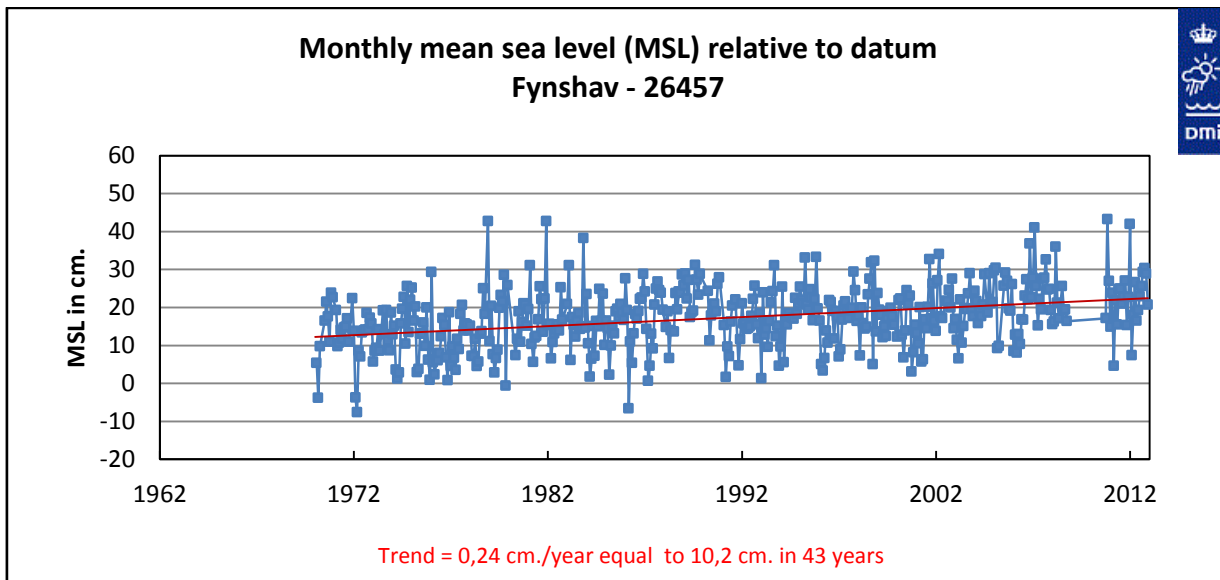Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Slipshavn – 28234

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1890	55° 17,3'	10° 49,6'	32U	6128565	616095
18-11-1996	55° 17,3'	10° 49,6'	32U	6128547	616070

Monthly mean sea level (MSL) relative to datum
Slipshavn - 28234

Trend = 0,10 cm./year equal to 12,5 cm. in 123 years

Yearly mean sea level (MSL) relative to datum
Slipshavn - 28234

Trend = 0,10 cm./year equal to 12,7 cm. in 123 years

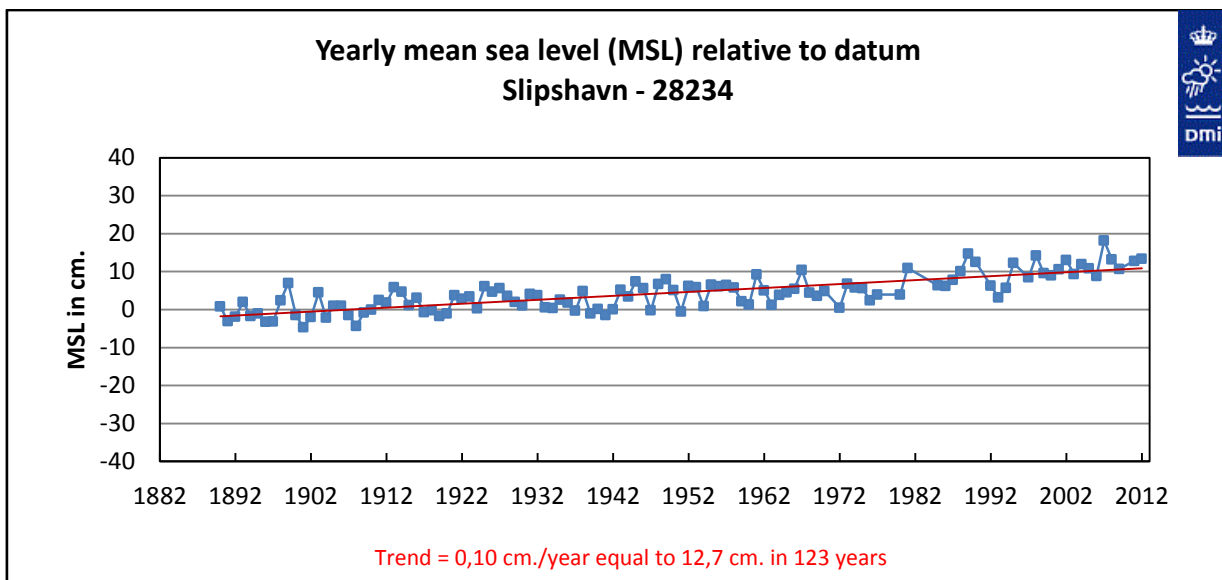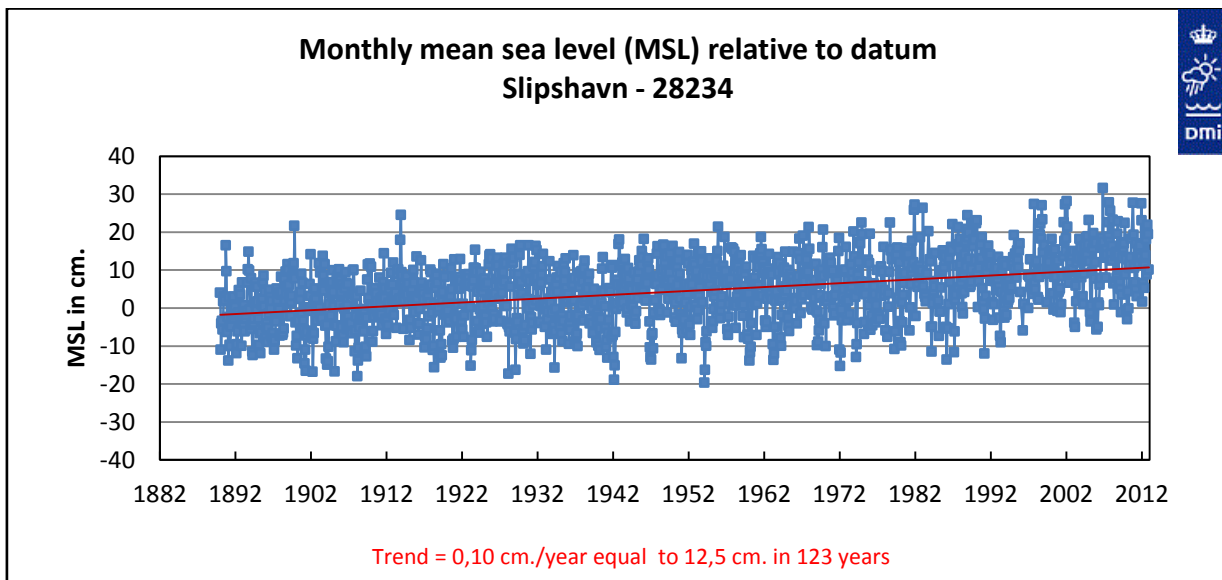| Datum	DVR - LN
Offset in cm.	-7

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Korsør – 29393

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1890	55° 19,8'	11° 8,6'	32U	6133865	636005
01-08-1924	55° 20,1'	11° 8,3'	32U	6134412	635754
16-10-1991	55° 20,1'	11° 8,3'	32U	6134411	635755
12-10-2000	55° 19,9'	11° 8,5'	32U	6133974	635890

Monthly mean sea level (MSL) relative to datum
Korsør - 29393

Trend = 0,09 cm./year equal to 10,6 cm. in 123 years

Yearly mean sea level (MSL) relative to datum
Korsør - 29393

Trend = 0,09 cm./year equal to 10,5 cm. in 123 years

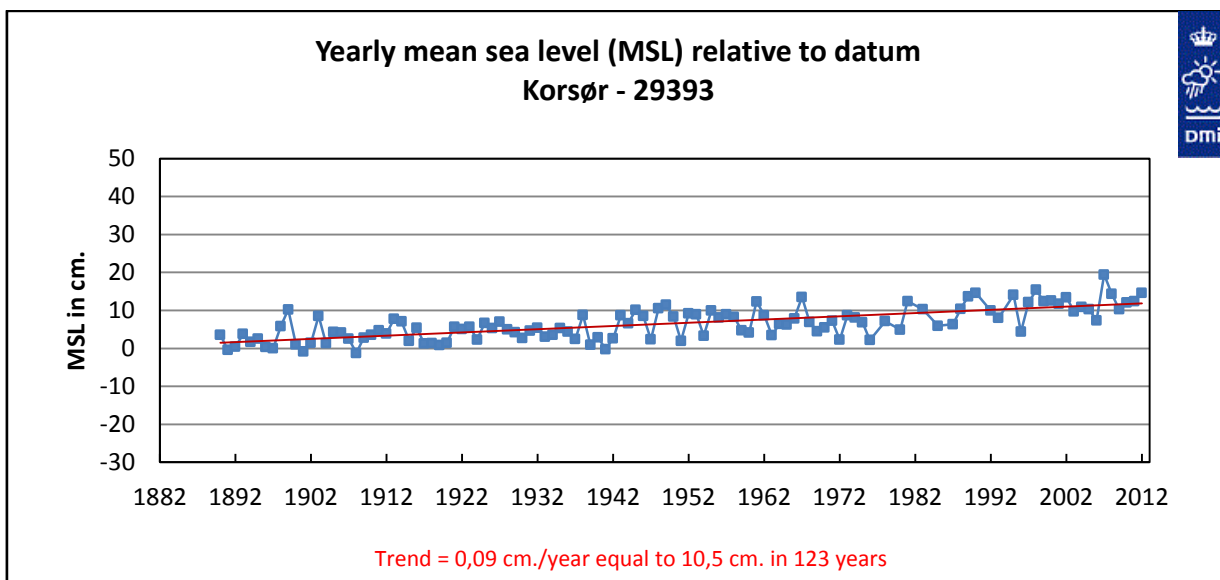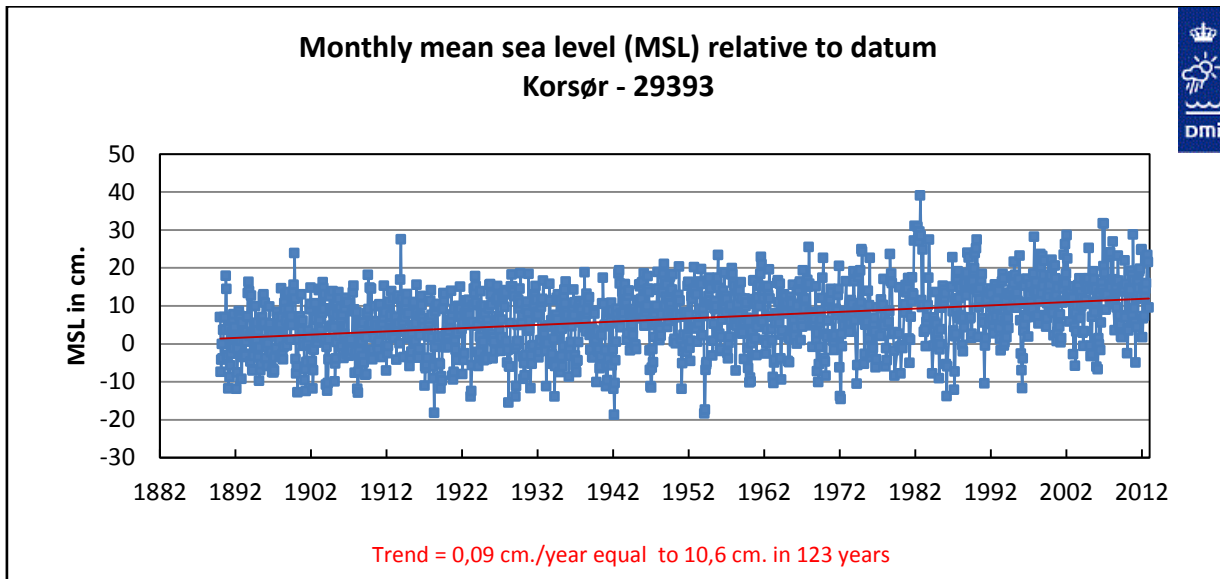| Datum	DVR - LN
Offset in cm.	-6

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Hornbæk – 30017

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1891	56° 5,6'	12° 27,4'	33V	6219602	341894
24-04-1959	56° 5,6'	12° 27,4'	33V	6219588	341879

Monthly mean sea level (MSL) relative to datum
Hornbæk - 30017

Trend = 0,04 cm./year equal to 5,2 cm. in 122 years

Yearly mean sea level (MSL) relative to datum
Hornbæk - 30017

Trend = 0,05 cm./year equal to 5,9 cm. in 122 years

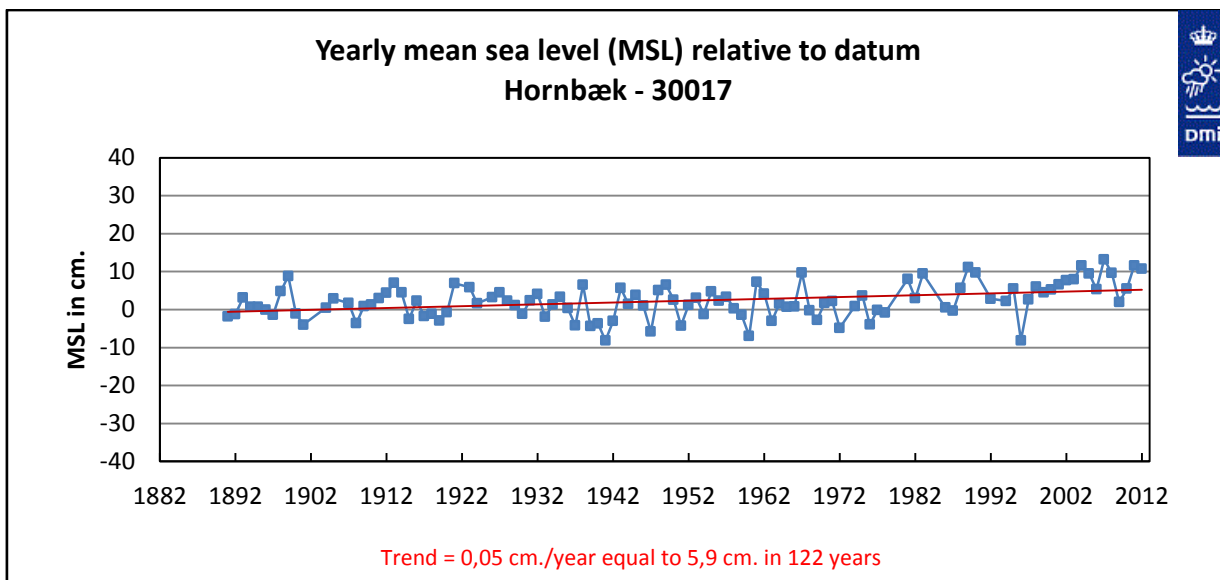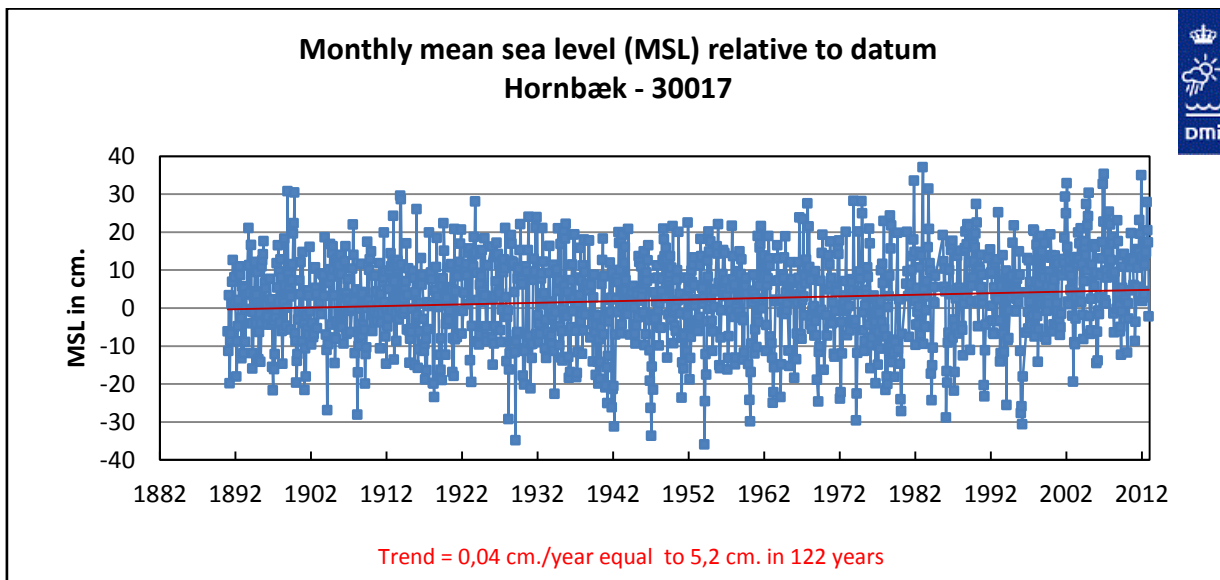| Datum	DVR - LN
Offset in cm.	-2

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

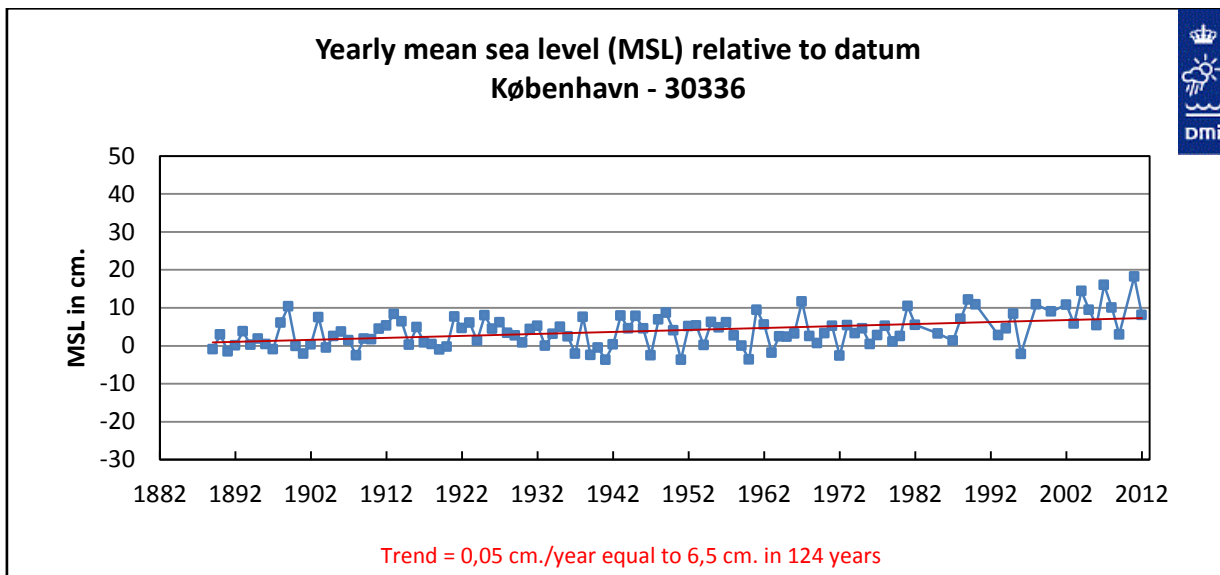Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

København – 30336

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1989	55° 41,4'	12° 36'	33U	6174345	349160
01-01-1985	55° 41,4'	12° 36'	33U	6174327	349154
24-06-1999	55° 42,3'	12° 35,9'	33U	6175974	349185
06-04-2001	55° 42,3'	12° 35,9'	33U	6175994	349197
19-01-2011	55° 42,3'	12° 35,9'	33U	6175981	349194

Monthly mean sea level (MSL) relative to datum
København - 30336

Trend = 0,05 cm./year equal to 6,3 cm. in 124 years

Yearly mean sea level (MSL) relative to datum
København - 30336

Trend = 0,05 cm./year equal to 6,5 cm. in 124 years

Datum	DVR - LN
Offset in cm.	0

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset
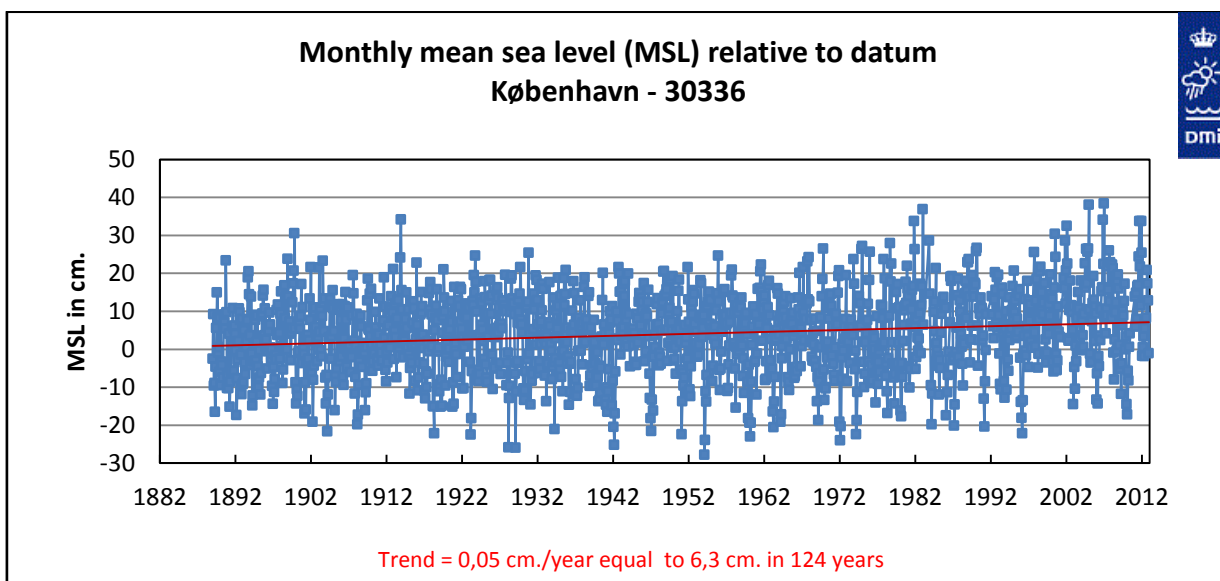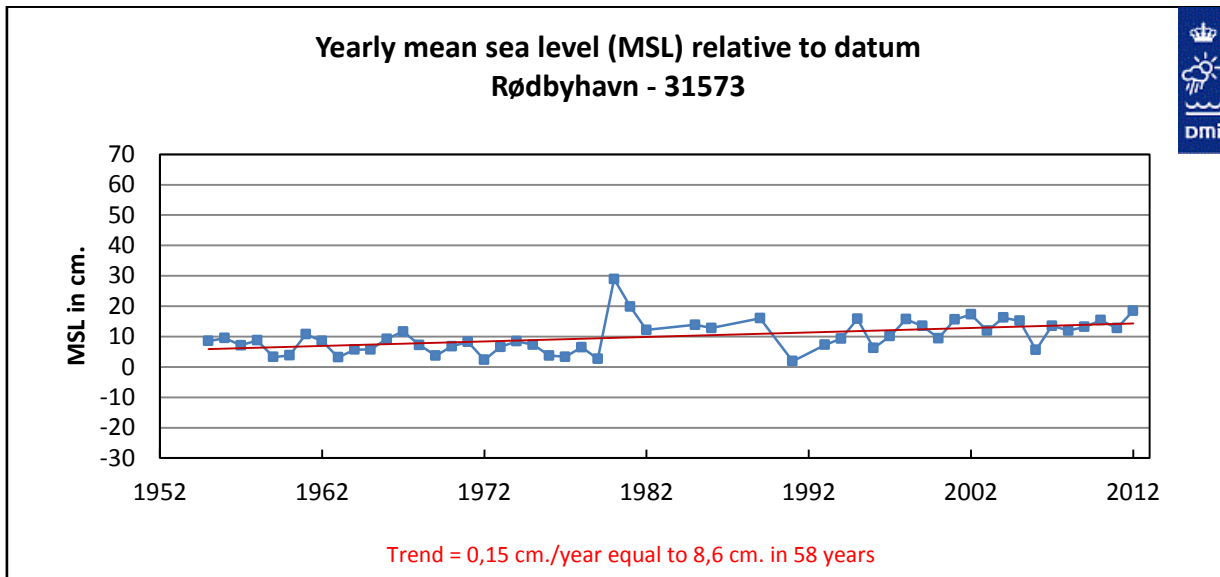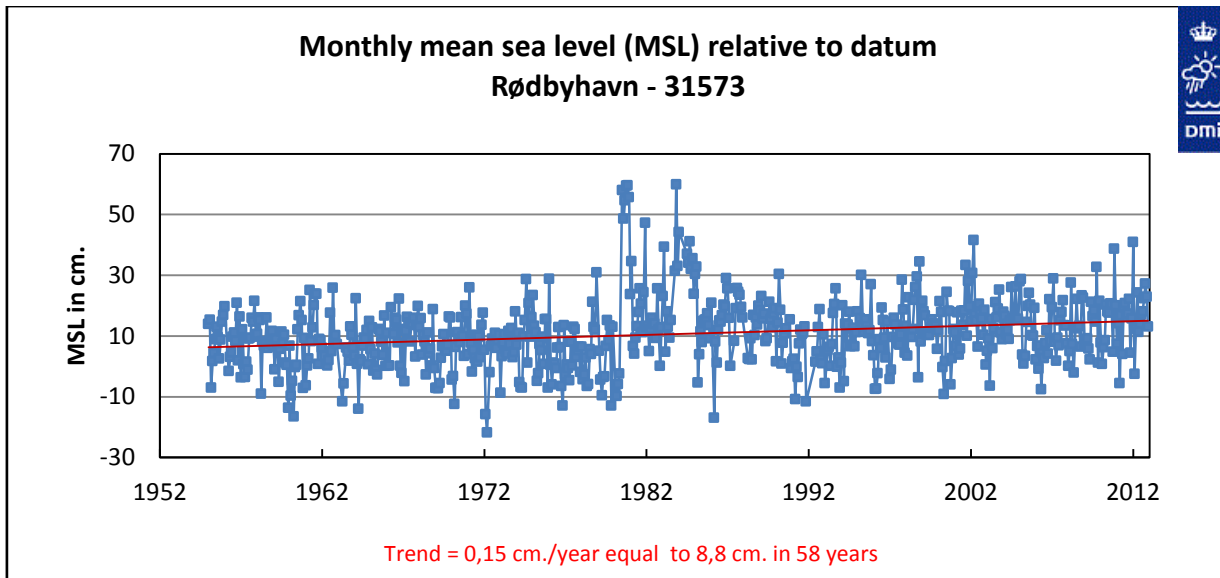
Rødbyhavn – 31573

Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1955	54° 39,3'	11° 20,8'	32U	6059150	651510

Monthly mean sea level (MSL) relative to datum
Rødbyhavn - 31573

Trend = 0,15 cm./year equal to 8,8 cm. in 58 years

Yearly mean sea level (MSL) relative to datum
Rødbyhavn - 31573

Trend = 0,15 cm./year equal to 8,6 cm. in 58 years

Datum	DVR - LN
Offset in cm.	-6

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Gedser – 31616

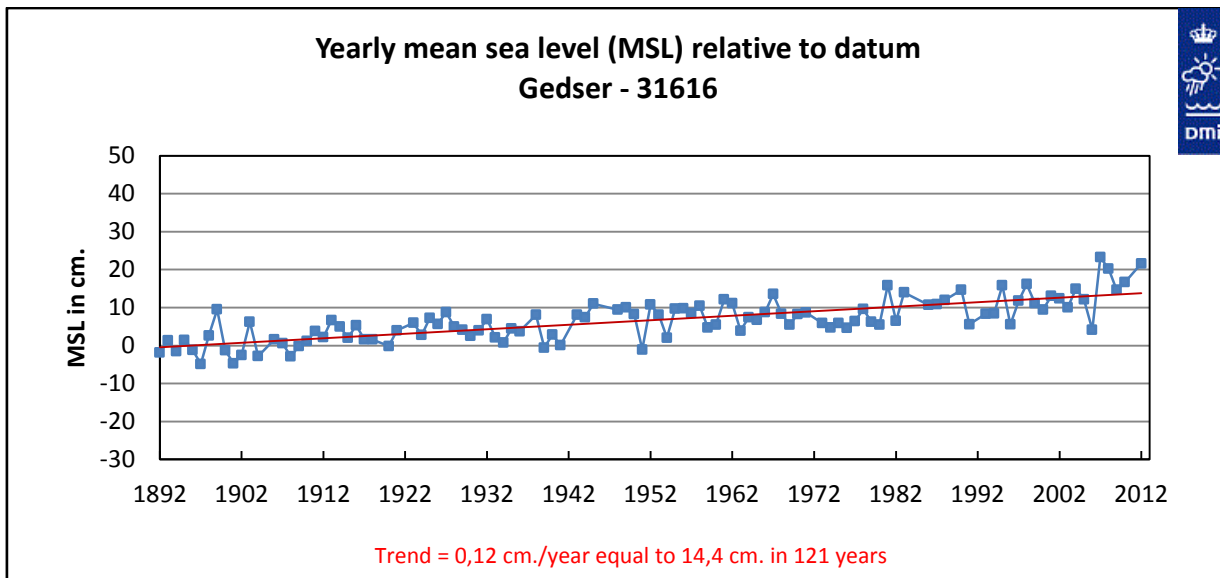| Position	WGS84		UTM (m) – ED50		
From	Latitude	Longitude	Zone	Northing	Easting
01-01-1892	54° 34,3'	11° 55,4'	32U	6051340	689090
23-11-2001	54° 34,3'	11° 55,5'	32U	6051317	689115

Monthly mean sea level (MSL) relative to datum
Gedser - 31616

Trend = 0,12 cm./year equal to 14,1 cm. in 121 years

Yearly mean sea level (MSL) relative to datum
Gedser - 31616

Trend = 0,12 cm./year equal to 14,4 cm. in 121 years
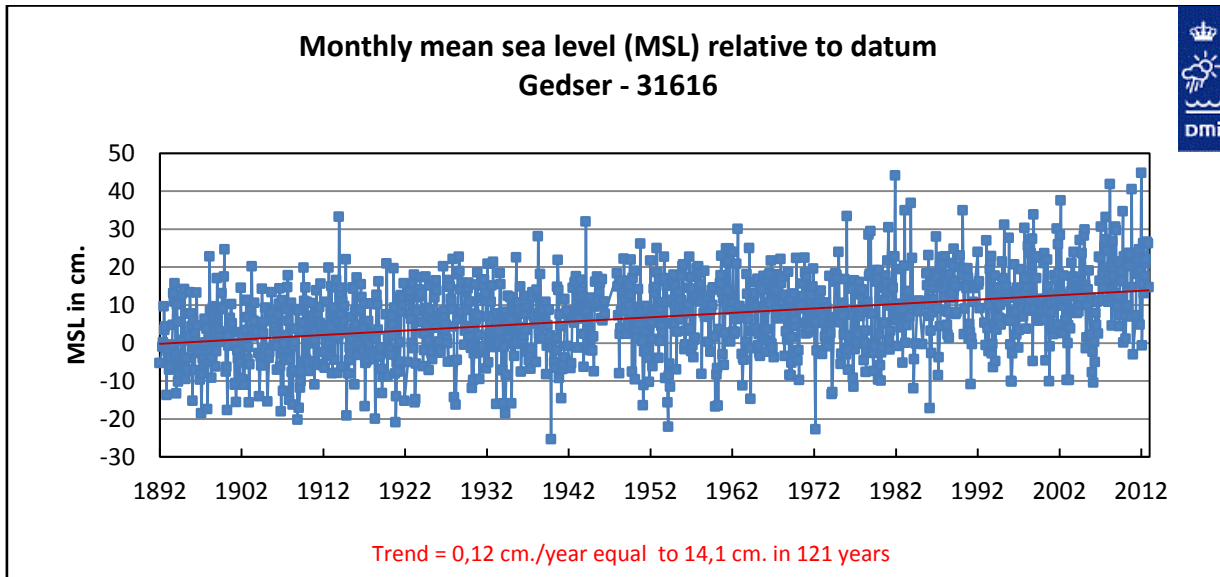
Datum	DVR - LN
Offset in cm.	-5

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

Tejn – 32048

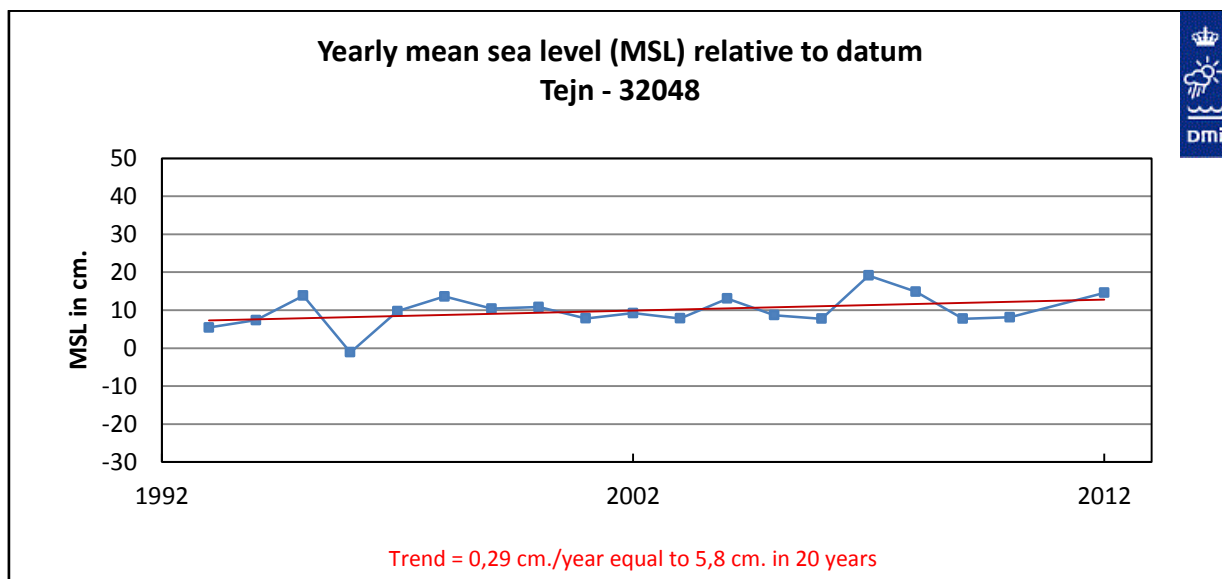| Position	WGS84		UTM (m) – ED50		
	Latitude	Longitude	Zone	Northing	Easting
From					
01-01-1993	55° 14,9'	14° 50,2'	33U	6122711	489692

Monthly mean sea level (MSL) relative to datum
Tejn - 32048

Trend = 0,29 cm./year equal to 5,8 cm. in 20 years

Yearly mean sea level (MSL) relative to datum
Tejn - 32048

Trend = 0,29 cm./year equal to 5,8 cm. in 20 years

Datum	DVR - LN
Offset in cm.	-8

LN is local zero, which is the originally established mean sea level (MSL) for the station

DVR is Danish Vertical Reference

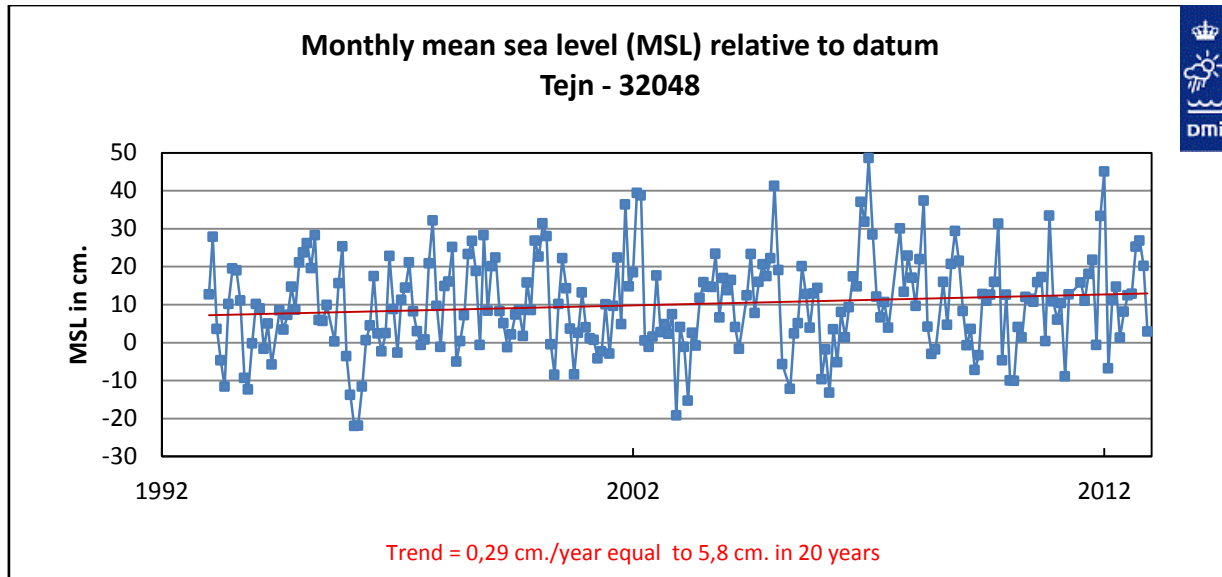Conversion from sea level (LN) to sea level (DVR): sea level (DVR) = sea level (LN) + offset

4. Attached files

Attached files are named month.csv and year.csv. The files are semicolon-separated with header-information in line 1 to 3 and data from line 4 and onwards as described below.

month.csv		Column									
		1	2	3	4	5	6	7	8	......	98
Header	Line 1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station2	......	Name of station14
	Line 2	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station2	......	DMI number of station14
	Line 3	Year	Month	Mean	Maximum	Minimum	NOO	Mean for plot	Year	......	Mean for plot
Data	Line 4 ...... Line 1491	......	......	......	......	......	......	......	......	....	......

year.csv		Column								
		1	2	3	4	5	6	7	......	84
Header	Line 1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station1	Name of station2	......	Name of station14
	Line 2	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station1	DMI number of station2	......	DMI number of station14
	Line 3	Year	Mean	Maximum	Minimum	NOO	Mean for plot	Year	......	Mean for plot
Data	Line 4 ...... Line 127	......	......	......	......	......	......	......	....	......

"NOO" is number of observations for actual month and year, respectively.
"Mean for plot" is average calculated only if number of observations >= 90 %
Missing values indicate no data.

5. Previous reports

Previous reports from the Danish Meteorological Institute can be found on:
http://www.dmi.dk/laer-om/generelt/dmi-publikationer/