

**ALBERTA TRANSPORTATION
INSTRUMENTATION MONITORING RESULTS
SPRING 2010**

SECTION C

NORTH CENTRAL (STONY PLAIN) REGION

SITE NC19: HWY 39:06 BUCK LAKE CREEK

1.0 OBSERVATIONS

1.1 Field Program and Instrumentation Status

Seven slope indicators (SI, SI-1, SI-2, SI-5, SI01-2A, SI01-3A, SI02-1 and SI02-2), one pneumatic piezometer (PN, PN01-2A) and two standpipe piezometers (SP, SP01-2A and SP01-3A) were read at the Buck Lake Creek site on May 11, 2010 by Mr. Kevin Leopold, Engineering Assistant and Ms. Elizabeth Kravontka, Junior CET of EBA Engineering Consultants Ltd. (EBA).

The SI's were read with a Durham Geo Slope Indicator Digi Indicator probe with a 0.61 m (2 foot) wheelbase and Digi Datamate readout. Inclinometer reading depths were defined as per 0.61 m (2 foot) cable markings with respect to the top of the inclinometer casing.

The PN's were read with an RST Instruments C108 PN Readout box. The SP's were read with a Solonist water level meter.

2.0 INTERPRETATION

2.1 General

Slope Inclinometers

SI plots for the A and B directions as well as the PN and SP data are presented in Section D and are summarized in the attached tables. The depths and rate of movements reduced from data collected by SI equipment is also presented in the attached tables.

In previous reports, the deflection of an instrument was presented based on the maximum cumulative resultant movement over the entire instrument, the incremental movement at a selected depth since the previous reading, the current rate of movement and the change in rate of movement since the previous monitoring period.

The maximum cumulative deformation of an inclinometer over the entire instrument, as provided in previous reports, does not necessarily present an accurate depiction of what is occurring at a specific inclinometer location. In many cases the maximum cumulative deformation of an inclinometer occurs near the top of an instrument casing where very little resistance is offered and the instrument may be subject to external forces (i.e. frost action),

generally not indicative of the movements the instrument was meant to capture. In general, the reporting of the maximum cumulative deformation of the inclinometer over the entire instrument may be inappropriate in relation to focusing on specific zones of movement.

The Slope Inclinometer Summary table provided presents a more comprehensive look at specific zones where the majority of movement appears to be occurring. Provided in this table are installation details, cumulative deformations and azimuths of deformation over associated select depth intervals, rates of movement and changes in the rate of movement related to the previous monitoring period.

Interpretation of the SI data was conducted as follows:

- Cumulative Deformation – calculated from the maximum value of resultant movements over the indicated zones of movement.
- Rate of movement – Calculated based on the maximum cumulative movement in the depth interval selected divided by the days elapsed since the instrument was installed, normalized over a year.
- Azimuth of Deformation – the azimuth that corresponds to the maximum value of resultant movement.

Piezometers

Pore pressures are presented as water level below ground surface (BGS). As such, an increase in pore pressure is demonstrated by a decrease in meters BGS (or a negative change since the previous reading). Likewise, a positive change since the previous reading relates to a decrease in pore pressure, or increase in meters BGS.

2.2 Zones of Movement

New zones of movement were not recorded since the last set of readings in the fall of 2009. Historic rates of movement are presented in the attached rate plots which show deformations at various zones over time.

2.3 Interpretation of Monitoring Results

In general, there is no appreciable change in the rates of movement since the fall 2009 monitoring period. SI-2 shows a deceleration in movement of <1 mm/yr at two shear zones in the upper 5 meters of the casing while SI01-2A and SI01-3A show a deceleration of <1mm/yr in a single zone in the upper 5 meters. The remaining two SI's (SI-1 and SI-5,) indicate rates of movement that are too small to be distinguished from instrument reading error. The performance of the 12 metre deep tangent pile wall installed in 2002 shows negligible movement as indicated by SI monitoring data from SI02-1 and SI02-2.

PN01-2A showed a decrease of pore water pressure equal to approximately 0.47 m of head. SI01-2A and SP01-3A also showed a decrease in water level of 0.1 and 0.35 m of head respectively.



3.0 RECOMMENDATIONS

3.1 Future Work

The instruments should be read again in the fall of 2010.

4.0 Instrument Repair

Instrumentation repair is not required at this time. Since the request to have piezometers PN-1, PN-2 and PN01-2A repaired was rejected by Alberta Transportation the piezometers have been removed from the instrument monitoring report.

NOT SUBMITTED INSTRUMENTS EXCLUDED FROM GROUP IN JAN 2010



SLOPE INCLINOMETER SUMMARY

Date Monitored: 10 May, 2010

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS	DATE OF PREVIOUS READING	INCREMENTAL MOVEMENT SINCE PREVIOUS READING (mm) †	RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr) ††
SI - 1	27 Aug, 1991	16.4 mm over 5.0 to 6.3 m depth in 166° direction	12.0 mm/yr between Oct 2006 and Nov 2008	Operational	21 Oct, 2009	No discernible movement	0.8	No Change
SI - 2	28 Oct, 1996	4.5 mm over 1.5 to 5.1 m depth in 54° direction	5.6 mm/yr between Oct 2009 and May 2010	Operational	21 Oct, 2009	No discernible movement	0.2 [†]	-0.1 [†]
		2.1 mm over 17.9 to 19.1 m depth in 259° direction	0.7 mm/yr between Oct 2009 and May 2010			1	0.1 [†]	-0.1 [†]
SI - 5	28 Oct, 1996	3.5 mm over 16.2 - 16.9 m depth in 354° direction	1.0 mm/yr between Oct 2009 and May 2010	Operational	21 Oct, 2009	No discernible movement	0.3 [†]	-0.1 [†]
SI01 - 2A	2 Aug, 2001	75.7 mm over 2.9 - 4.1 m depth in 254° direction	90.1 mm/yr between Aug and Sept 2001	Operational	21 Oct, 2009	1	9.2	-0.4
SI01 - 3A	23 May, 2001	87.8 mm over 2.3 - 3.6 m depth in 6° direction	155.5 mm/yr between May and Aug 2001	Operational	21 Oct, 2009	No discernible movement	9.8	-0.7
SI02 - 1	19 Jul, 2002	18.6 mm over 1.8 - 2.4 m depth in 335° direction	7.4 mm/yr between May and Oct 2004	Operational	21 Oct, 2009	No discernible movement	2.4	-0.2
SI02 - 2	19 Jul, 2002	4.1 mm over 3.7 - 4.3 m depth in 331° direction	6.4 mm/yr between Jul and Aug 2002	Operational	21 Oct, 2009	No discernible movement	0.5 [†]	-0.2 [†]

Notes:

†According to Durham Geo Slope Indicator (DGSI) "Slope Indicator's inclinometer equipment provides a system accuracy of ±0.01 inch (0.25mm) per reading, or ±0.3 inches (6mm) accumulated over 50 readings". This is a conservative, but practical specification of the accuracy that can be expected when casing is installed within 3° of vertical and proper reading techniques are used.

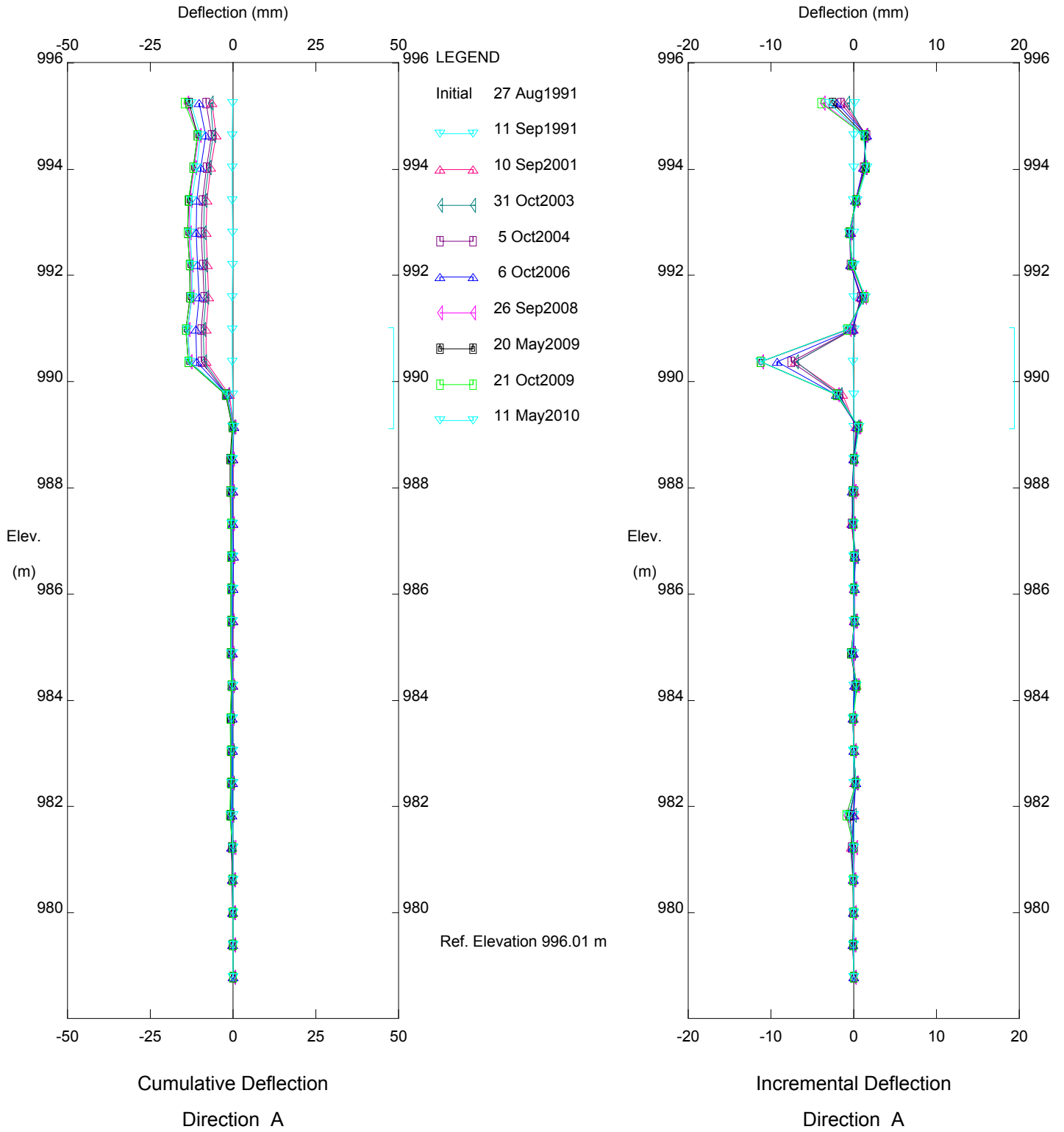
†† some intervals have been adjusted to reflect the changing movements over time.

PNEUMATIC/STANDPIPE PIEZOMETER SUMMARY

Date Monitored: 10 May, 2010

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM PORE PRESSURE/DEPTH	MEASURED PORE PRESSURE/DEPTH	CURRENT WATER LEVEL BGS (m)	PREVIOUS WATER LEVEL BGS (m)	CHANGE IN WATER LEVEL BGS SINCE PREVIOUS READING (m)
PN01-2A (24313)	23 May, 2001	24.41	995.4	Active	202 kPa on 23 May, 2008	191.2 kPa	4.91	4.44	+0.47
SP01 - 2A	23 May, 2001	18.92	995.2	Active	10.51 m on 10 May, 2010	10.51 m	9.9	9.8	+0.1
SP01 - 3A	23 May, 2001	19.90	989.9	Active	0.5 m on 16 May, 2007	1.15 m	0.39	0.04	+0.35

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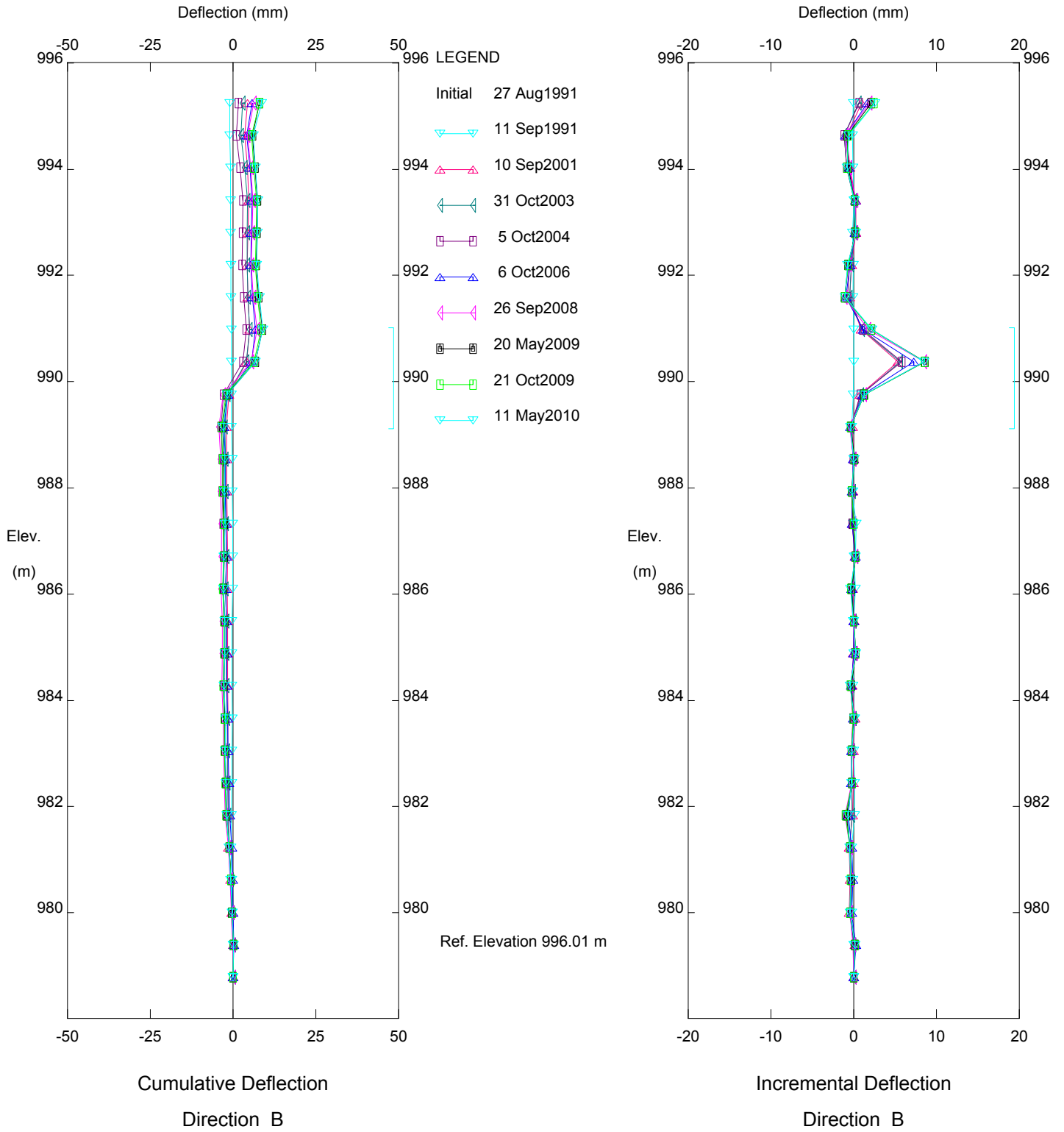


NC19, Inclinometer SI-1

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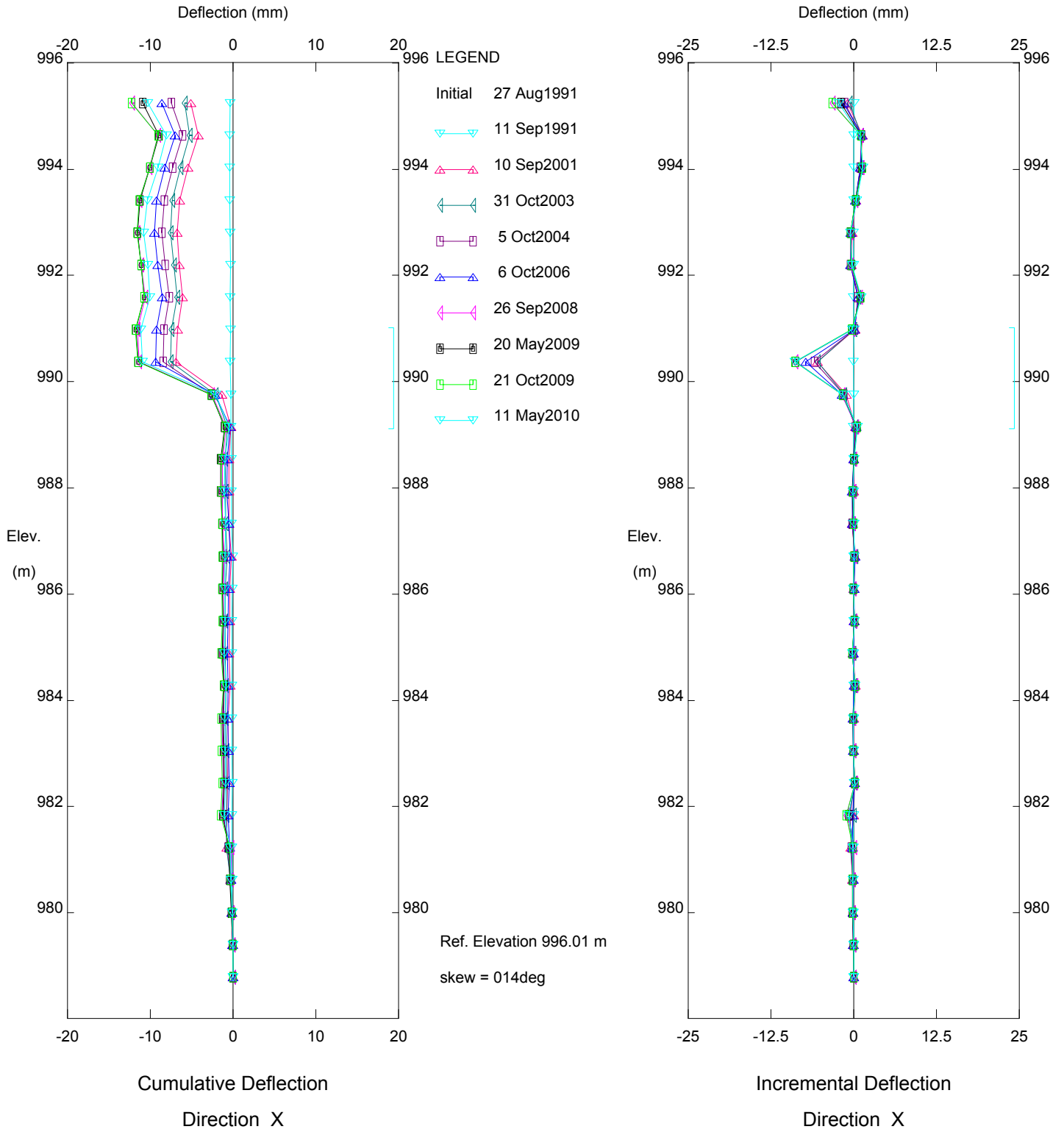


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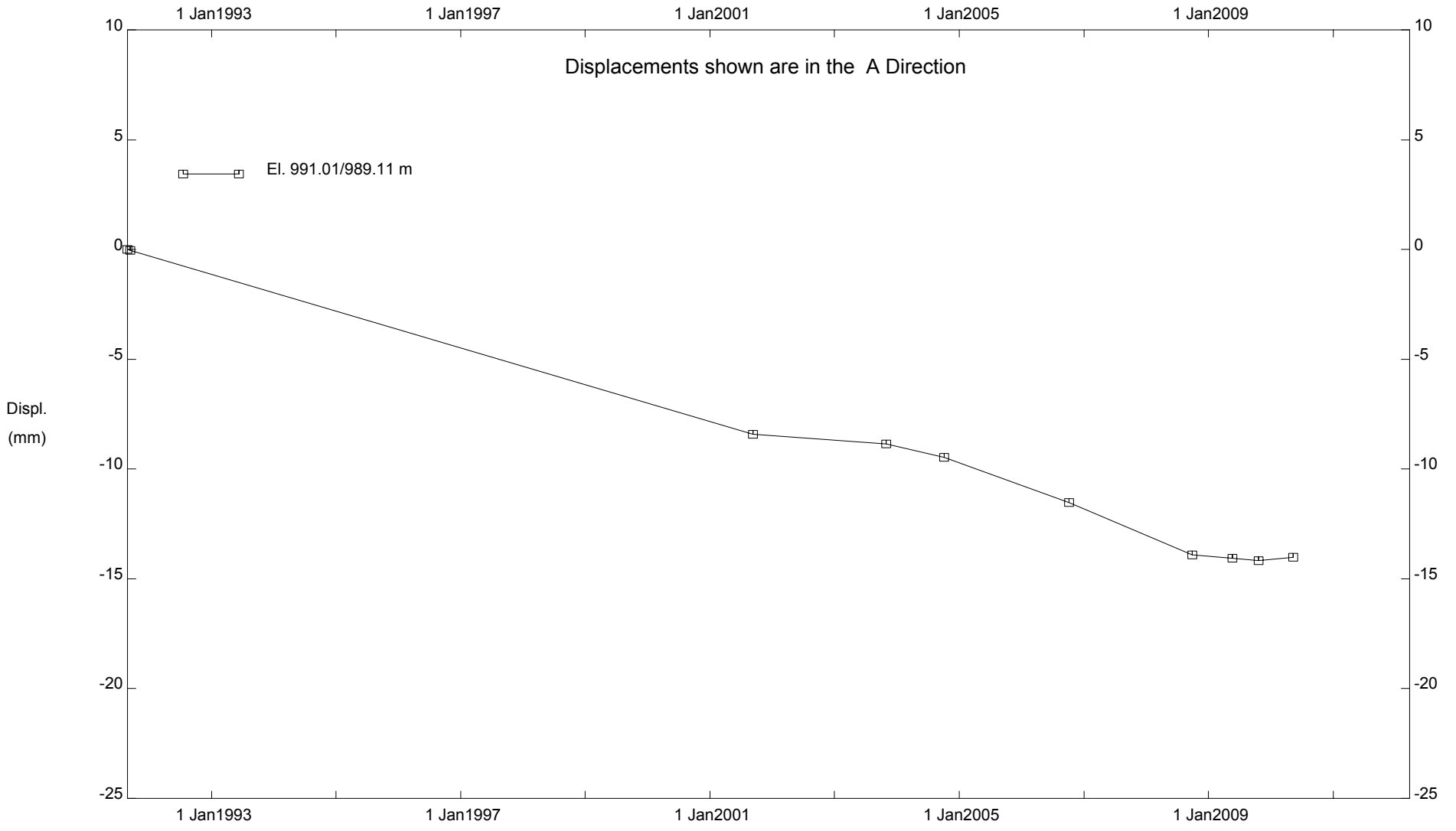


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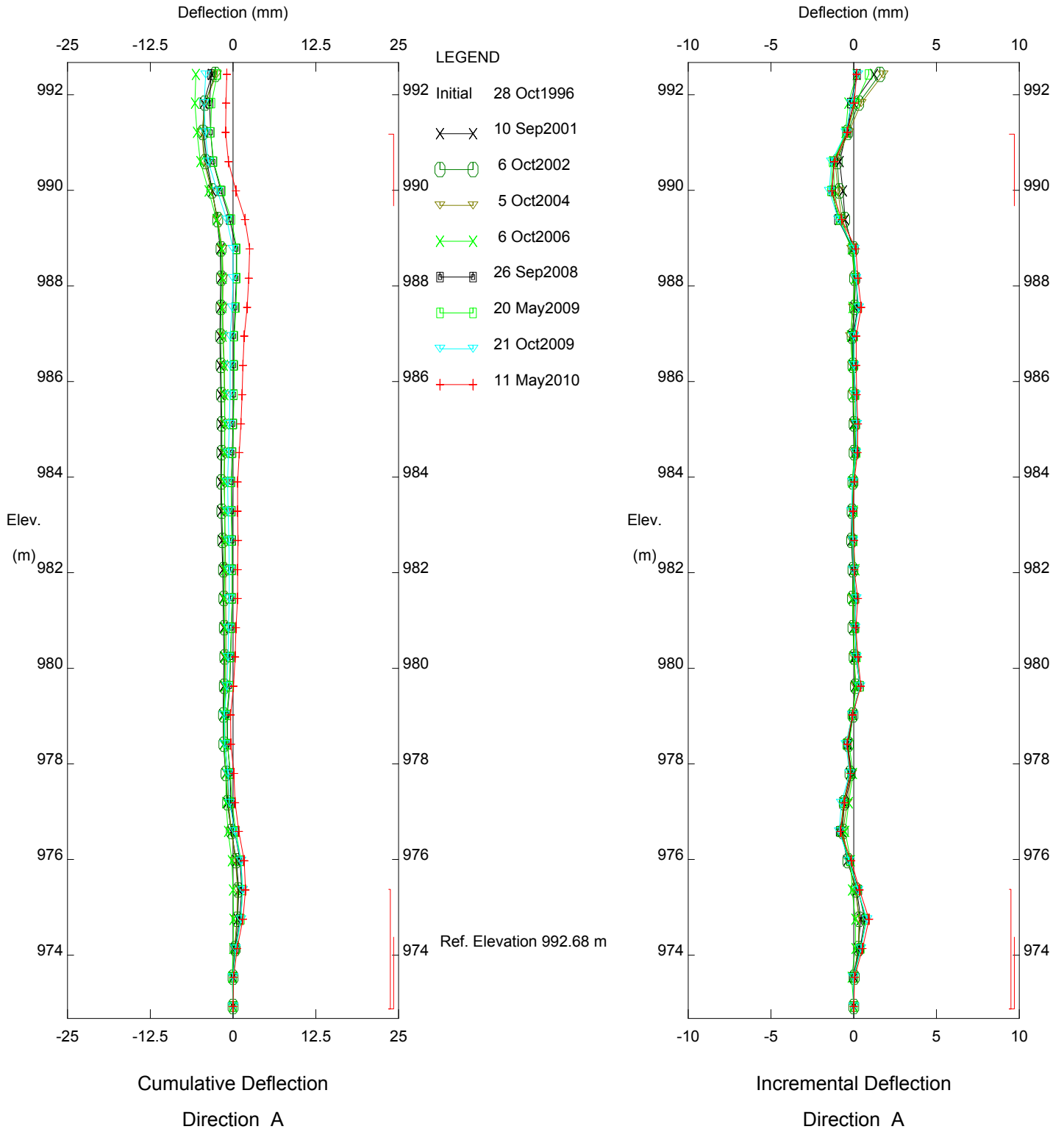
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NC19, Inclinator SI-1

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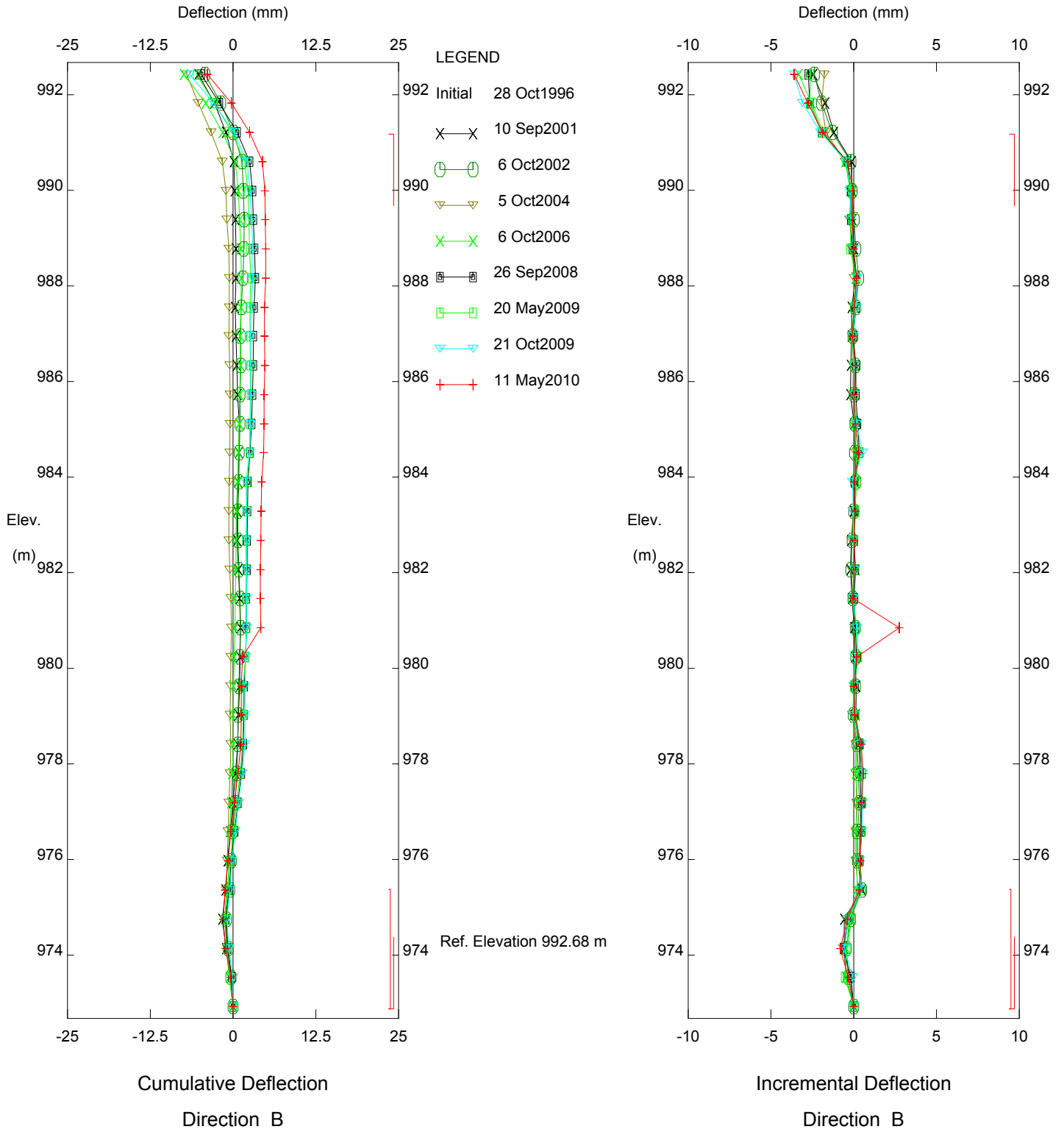


NC19, Inclinometer SI-2

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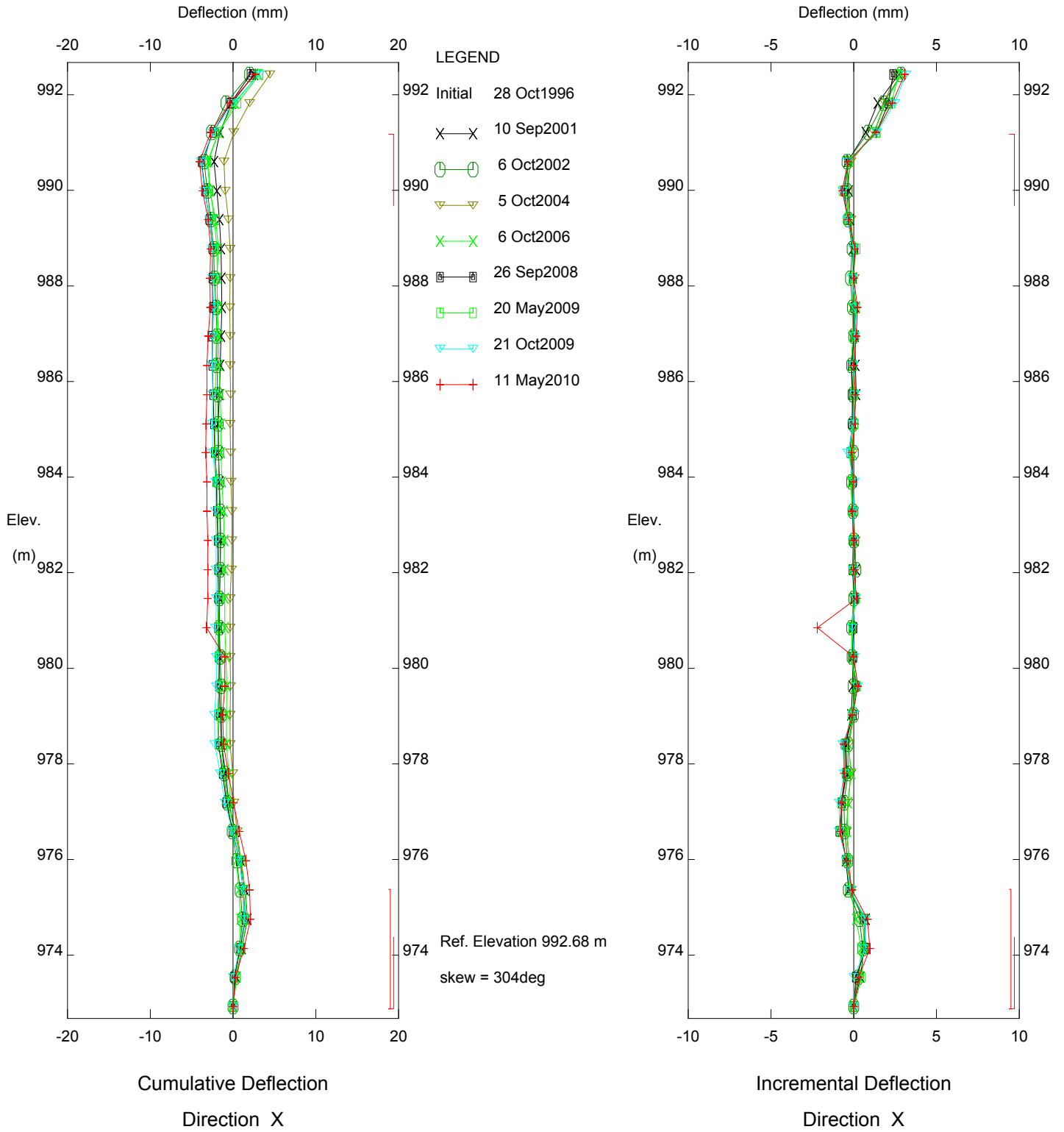


NC19, Inclinometer SI-2

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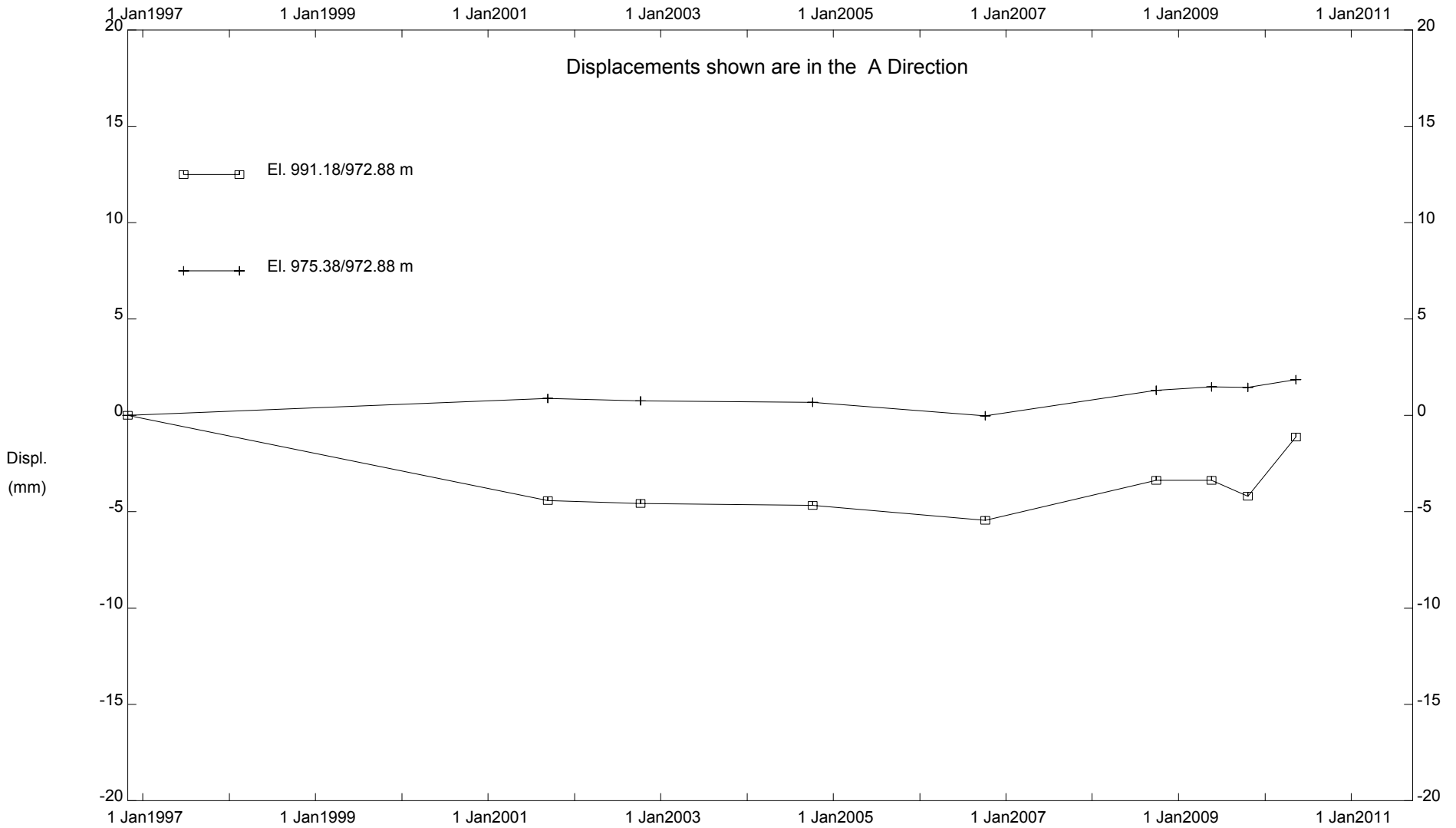


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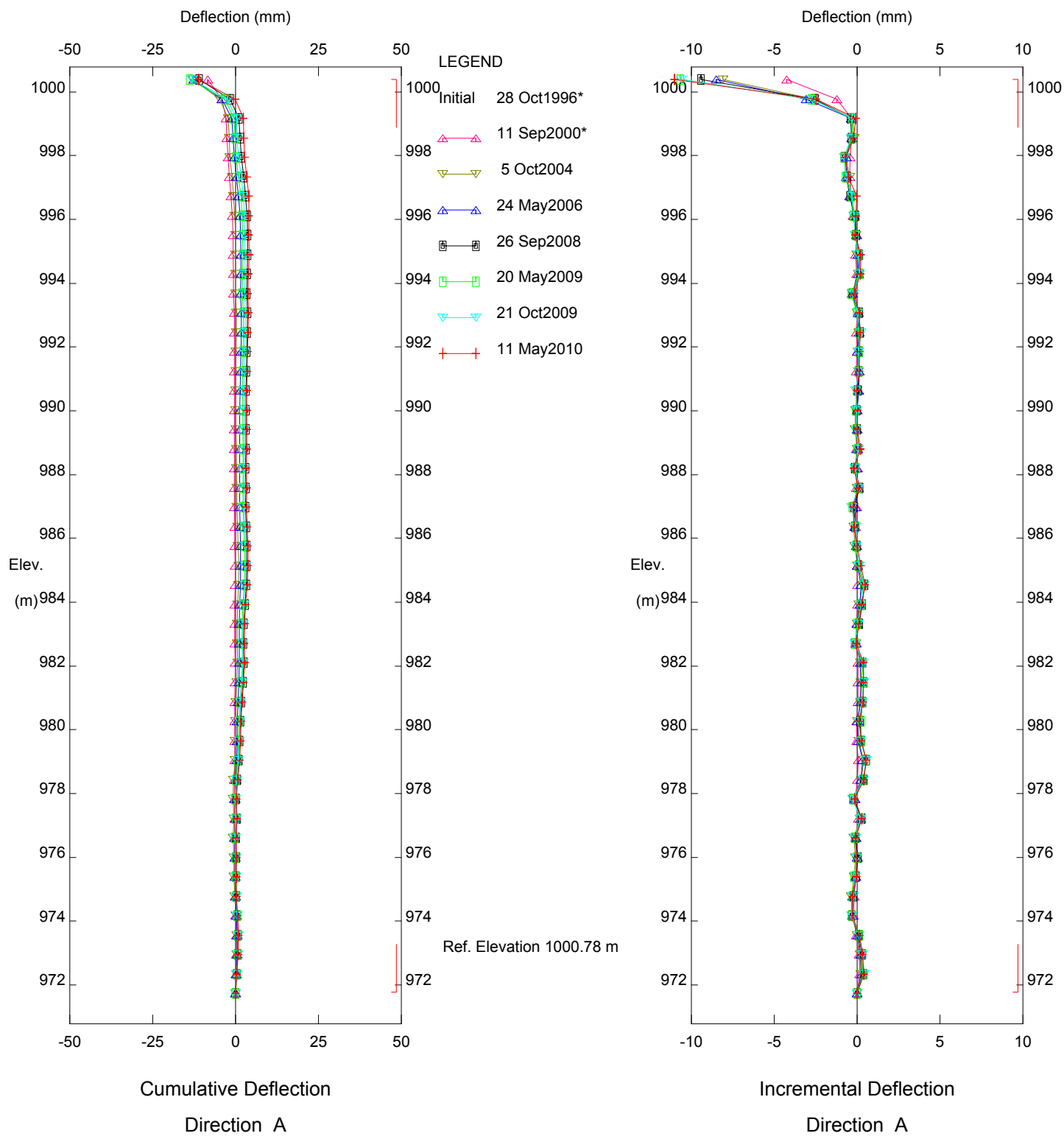
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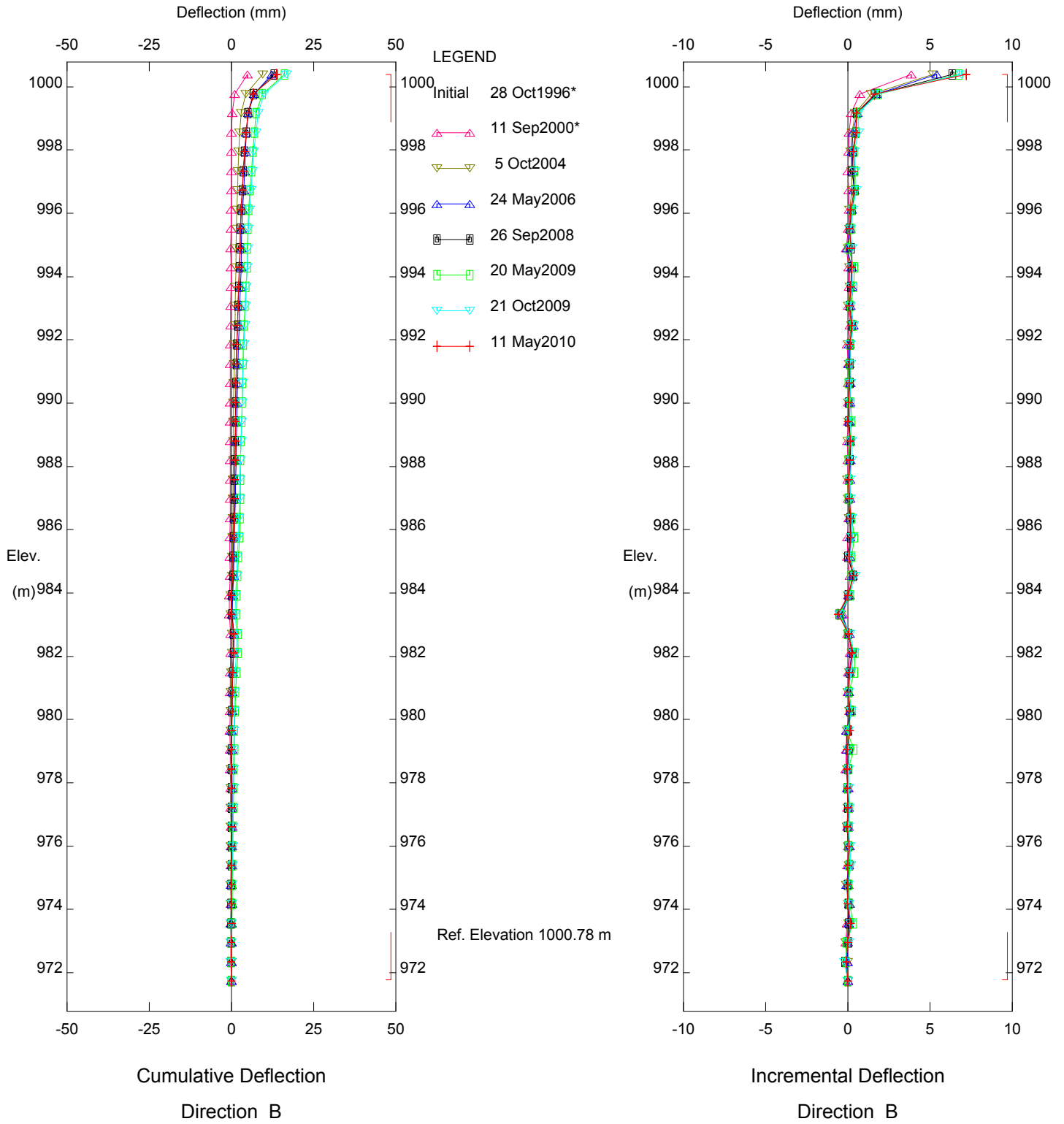
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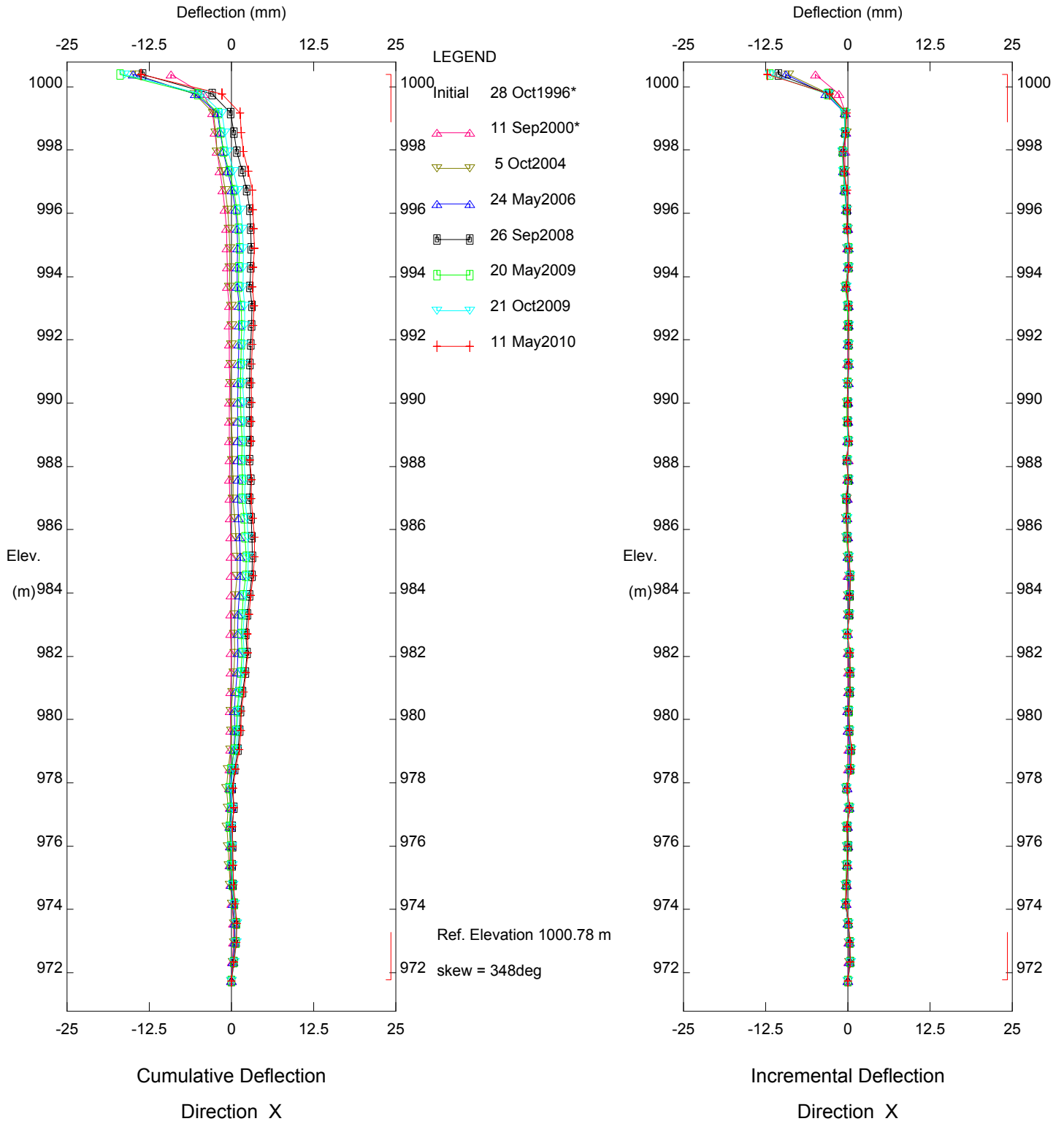
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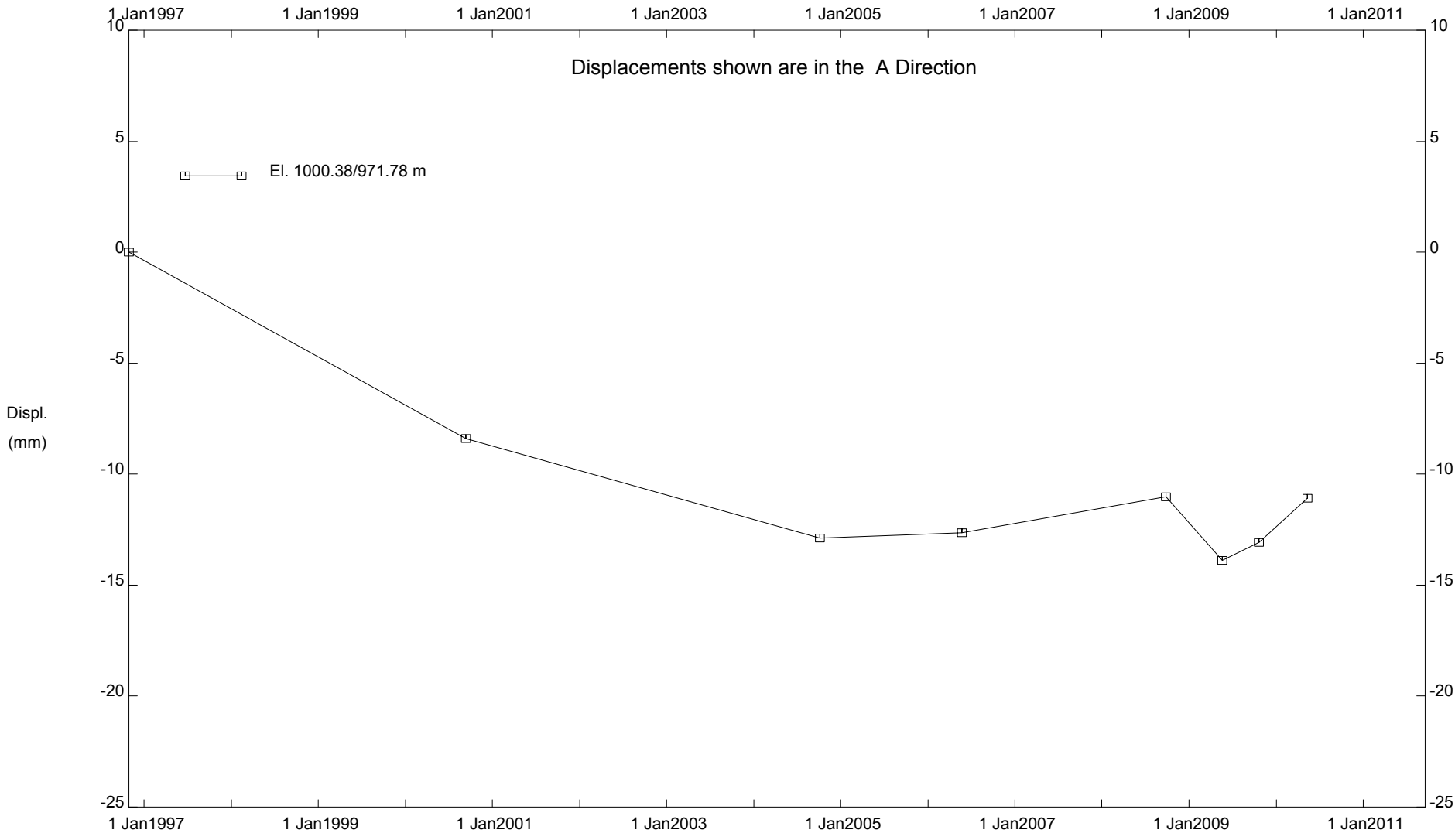
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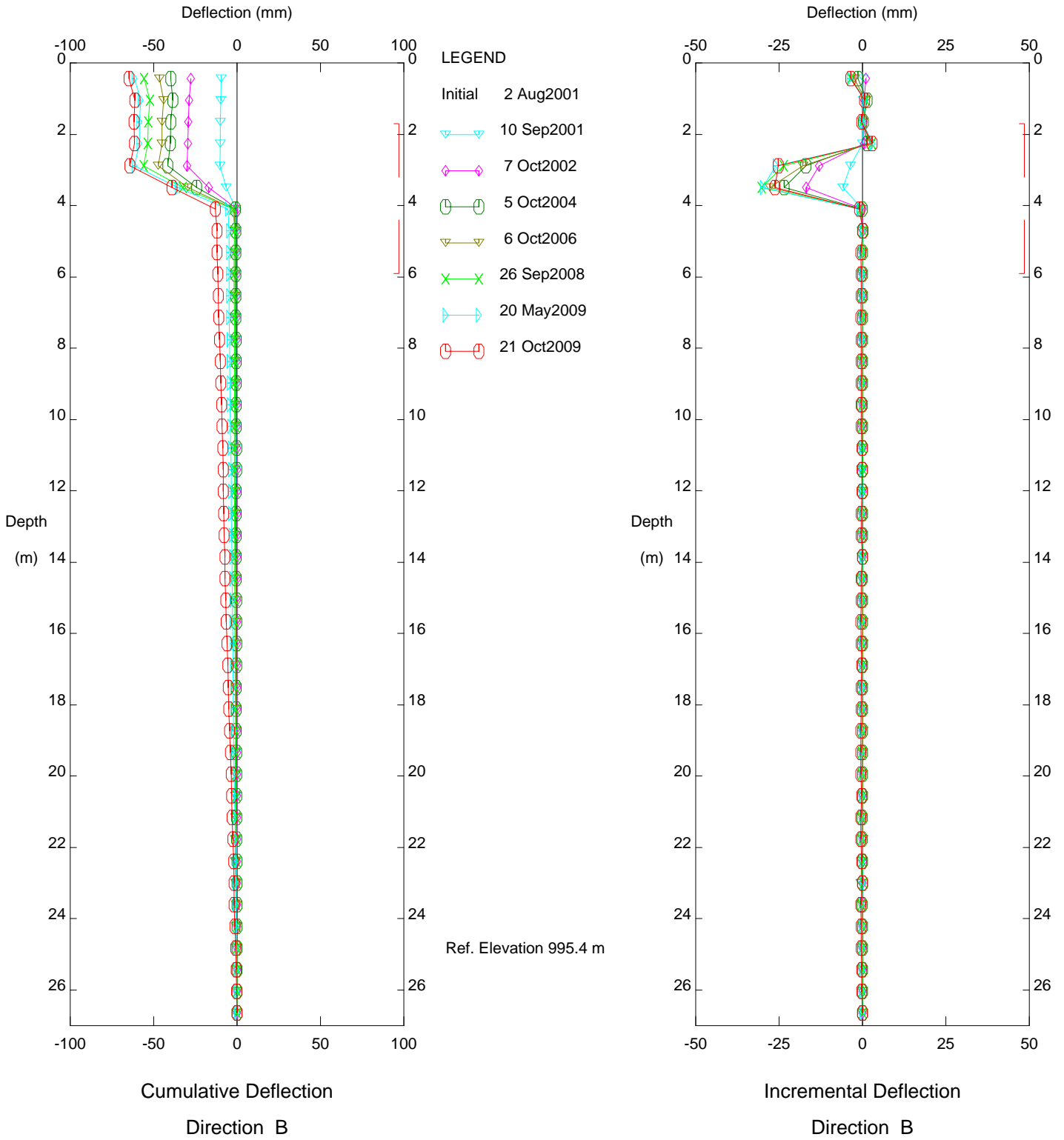
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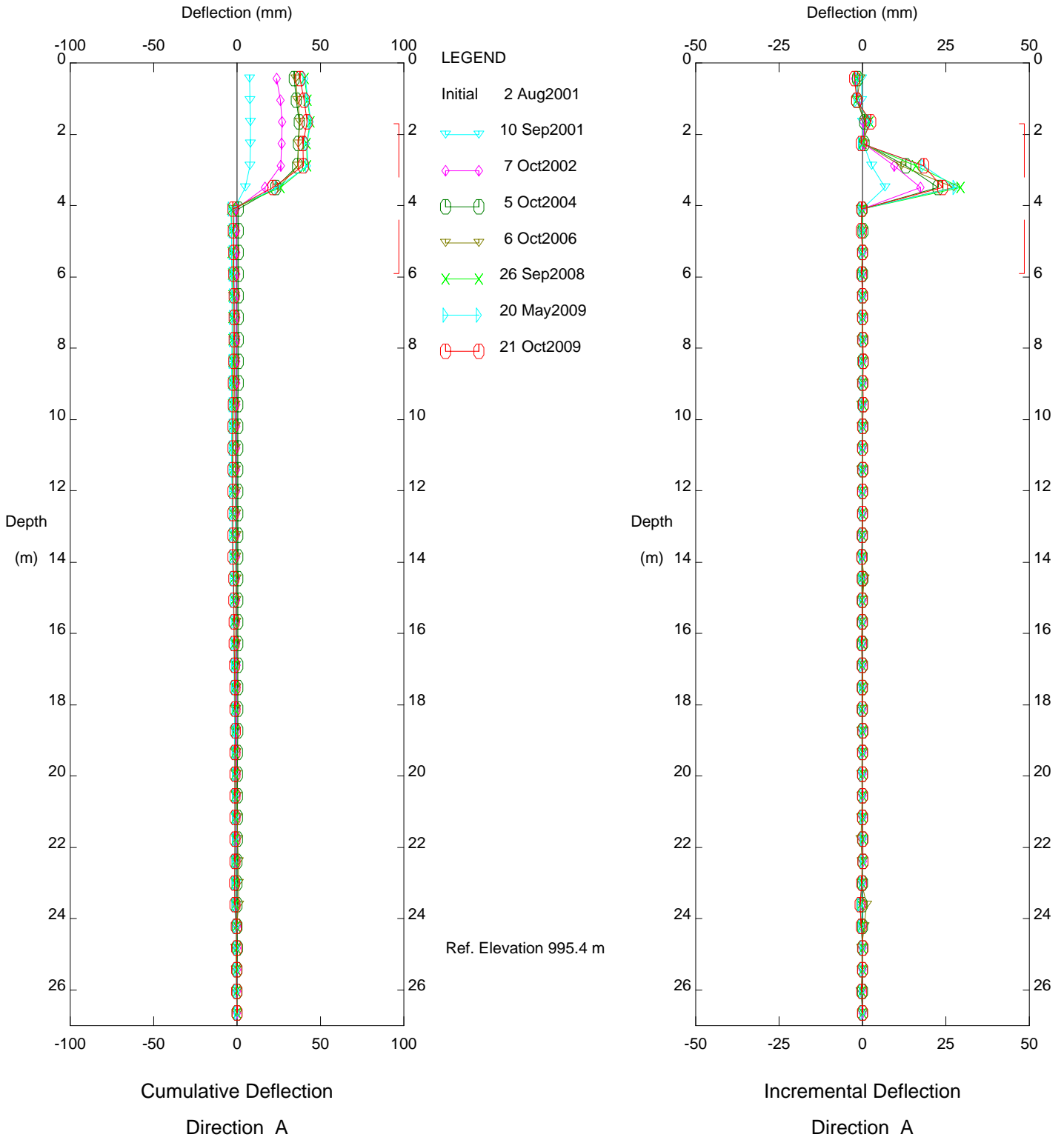


NC19, Inclinometer SI01-2A

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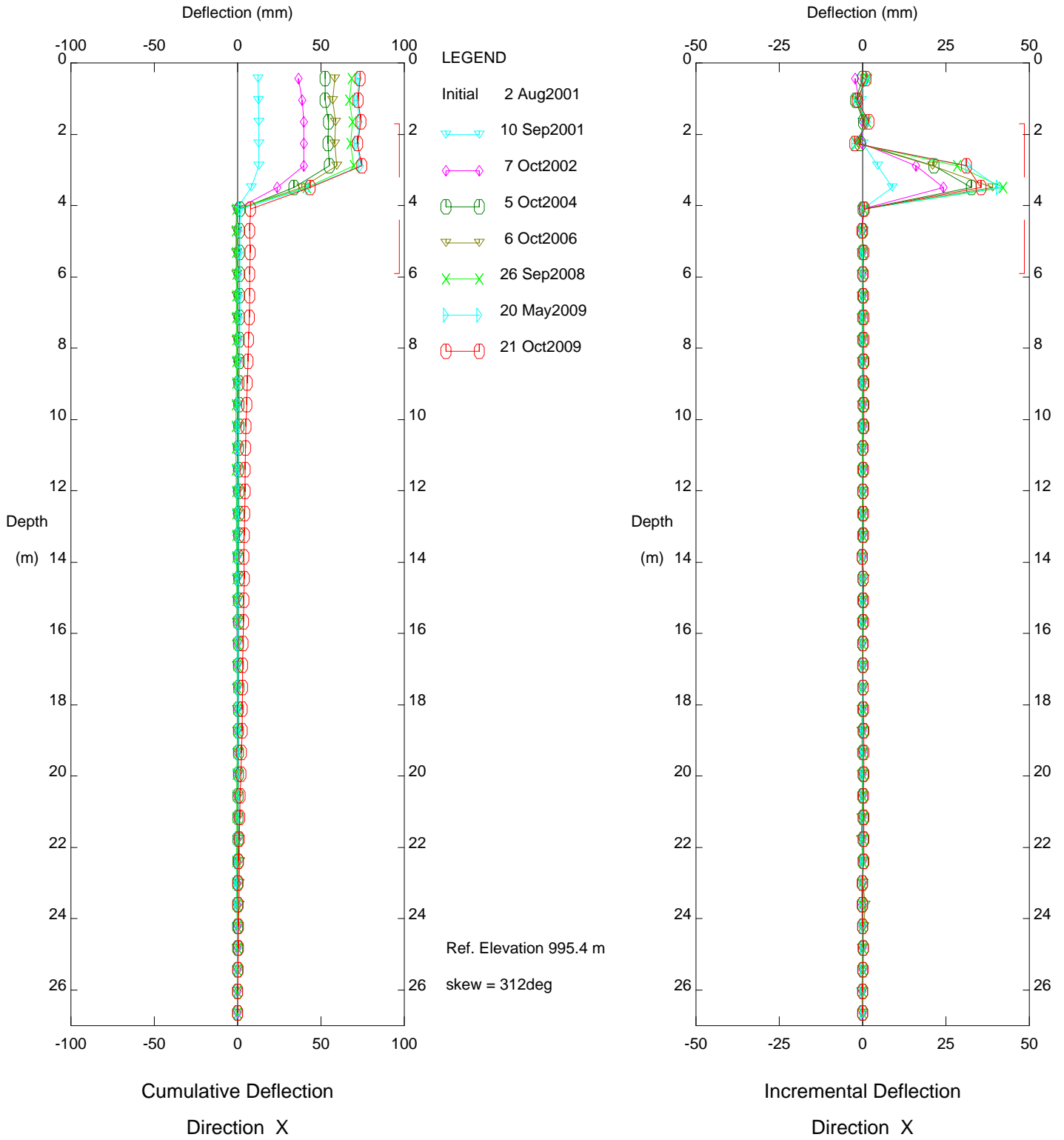


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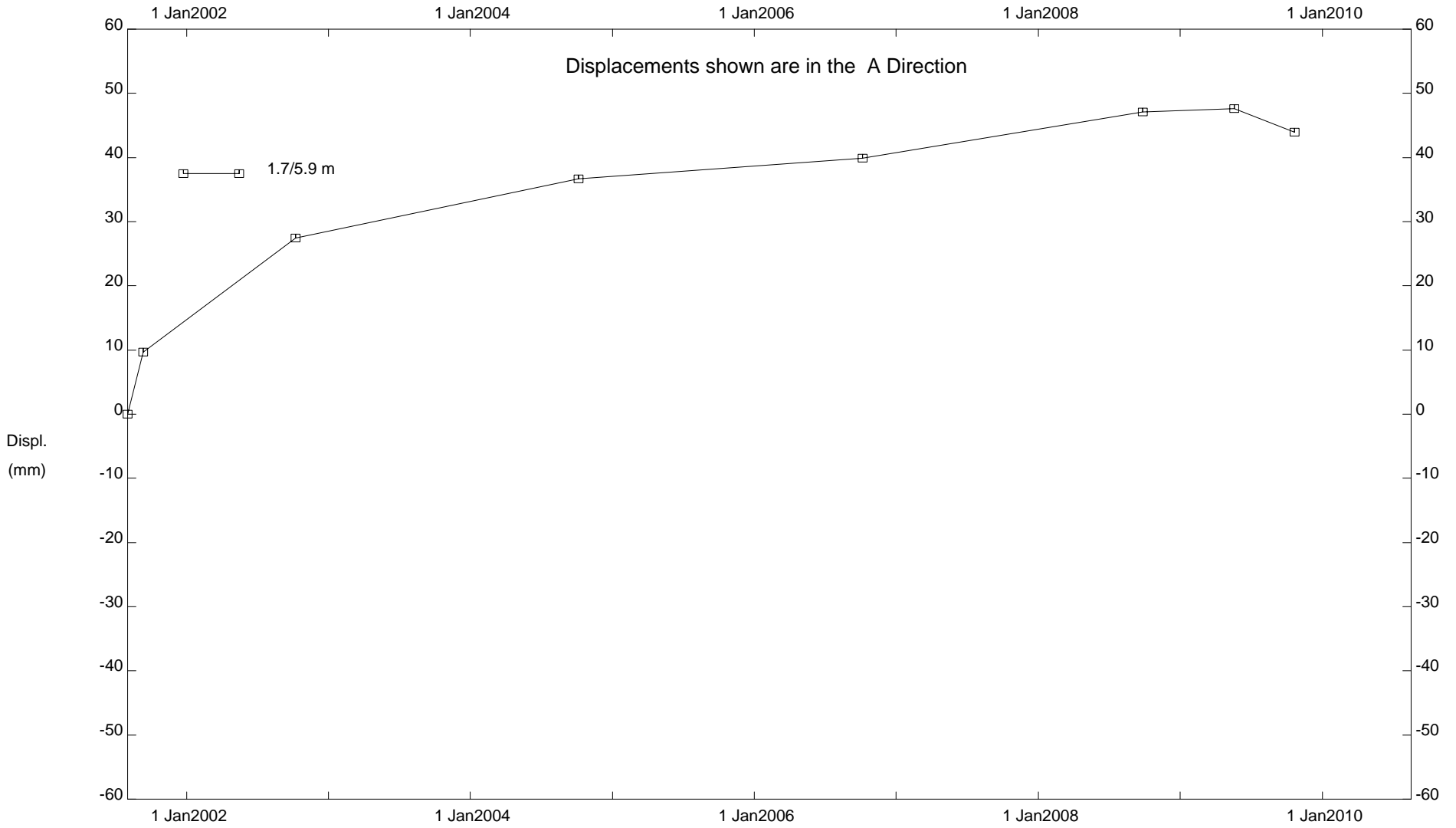


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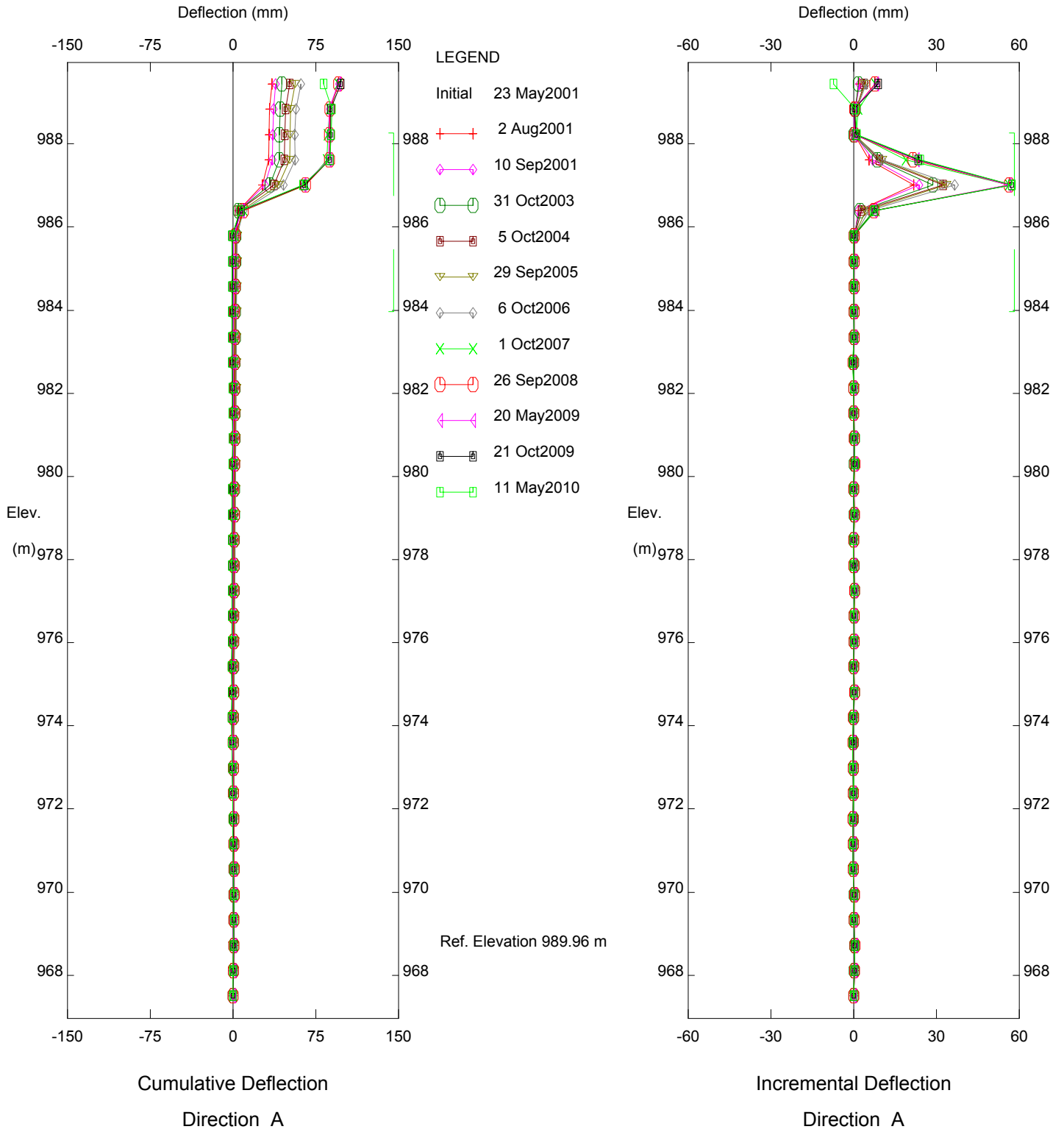
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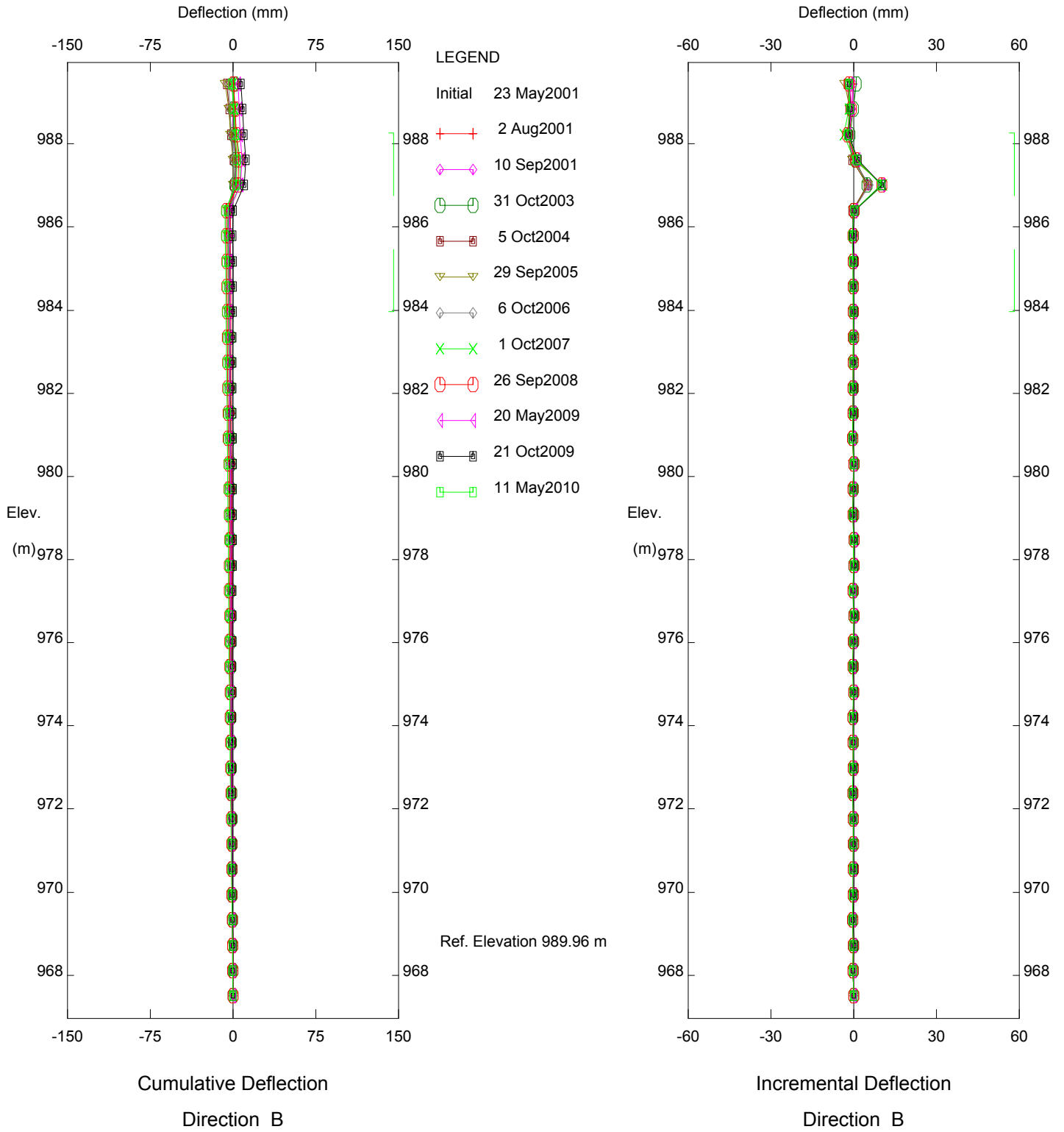


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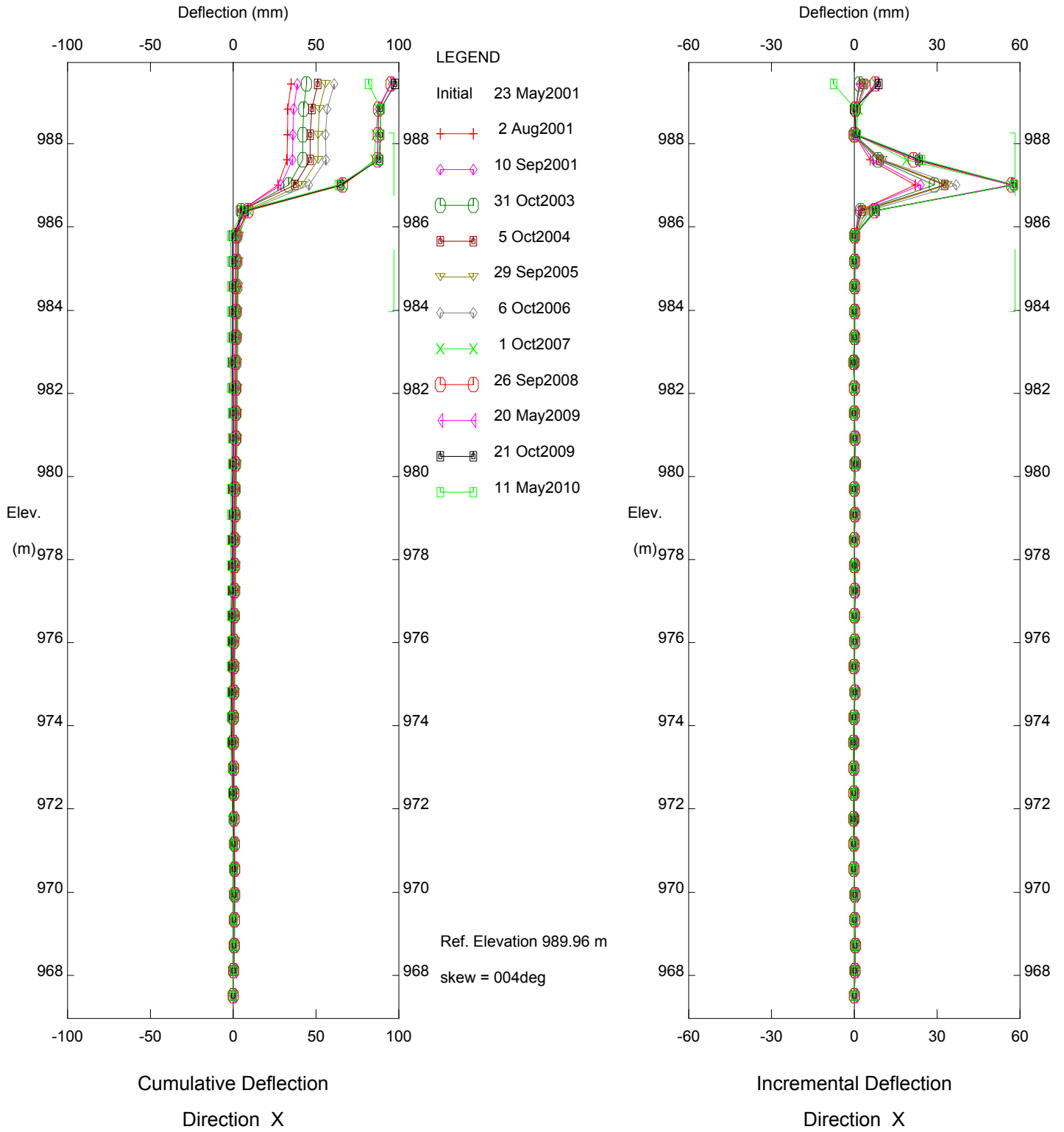


NC19, Inclinometer SI01-3A

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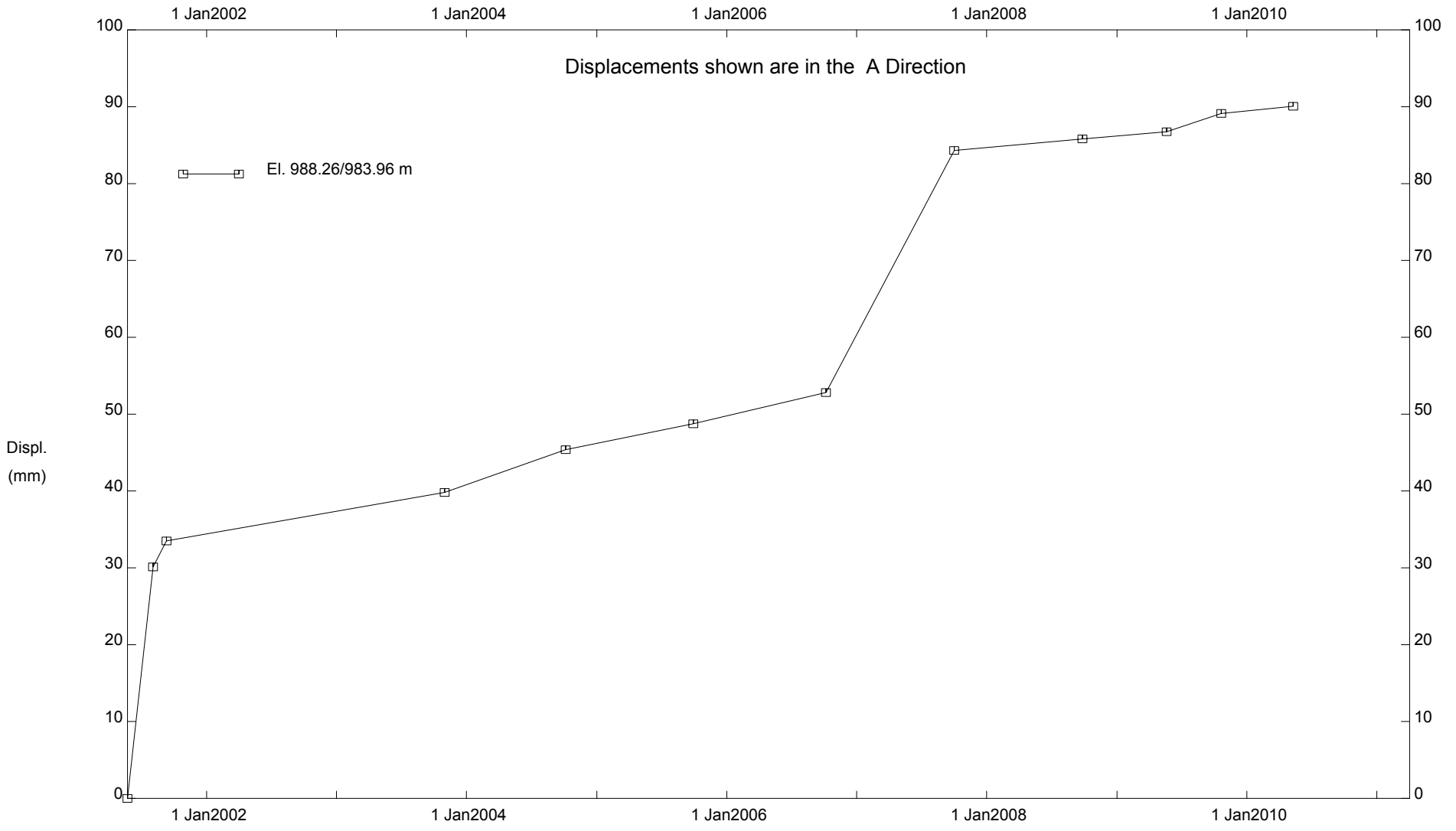
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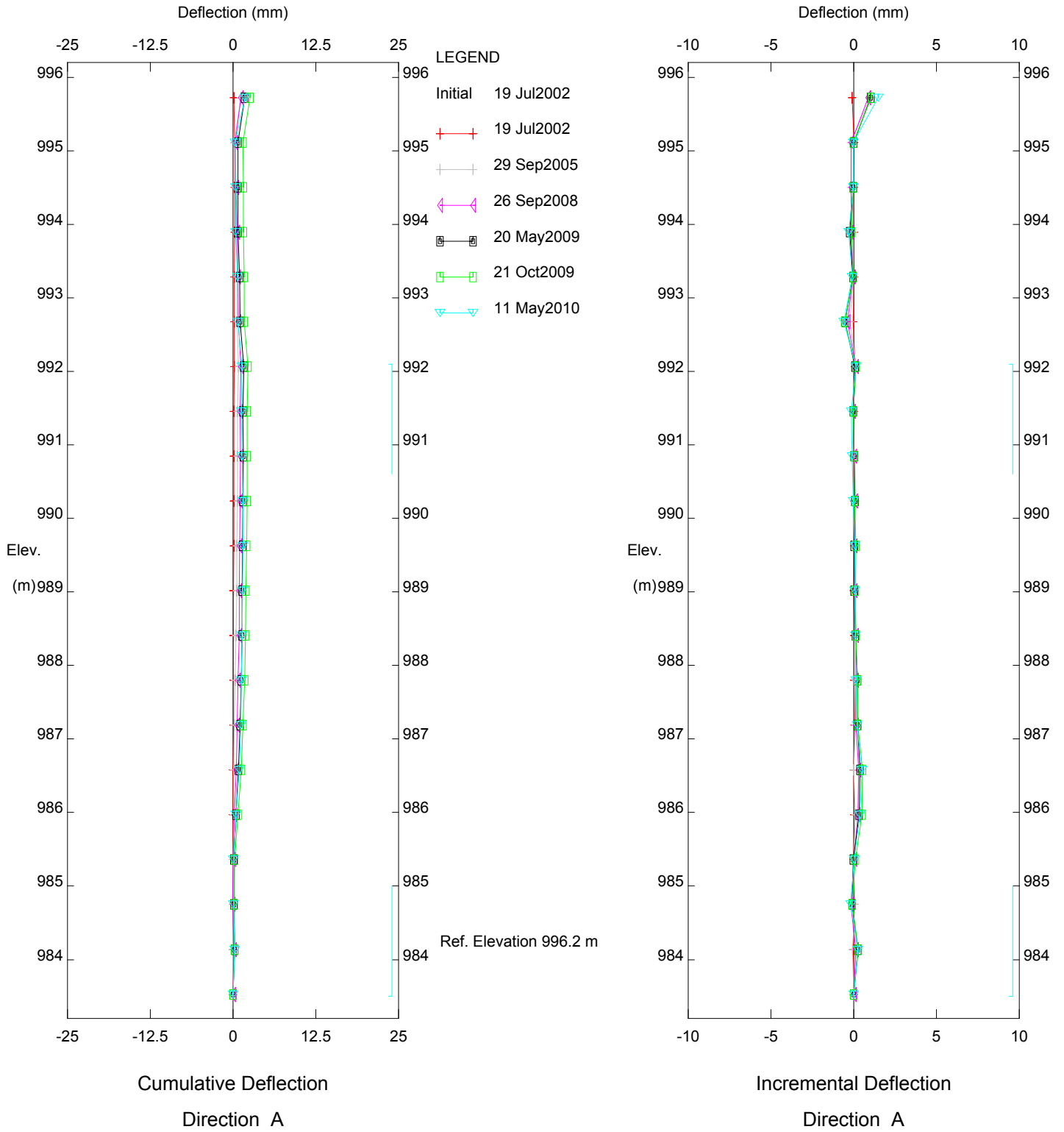
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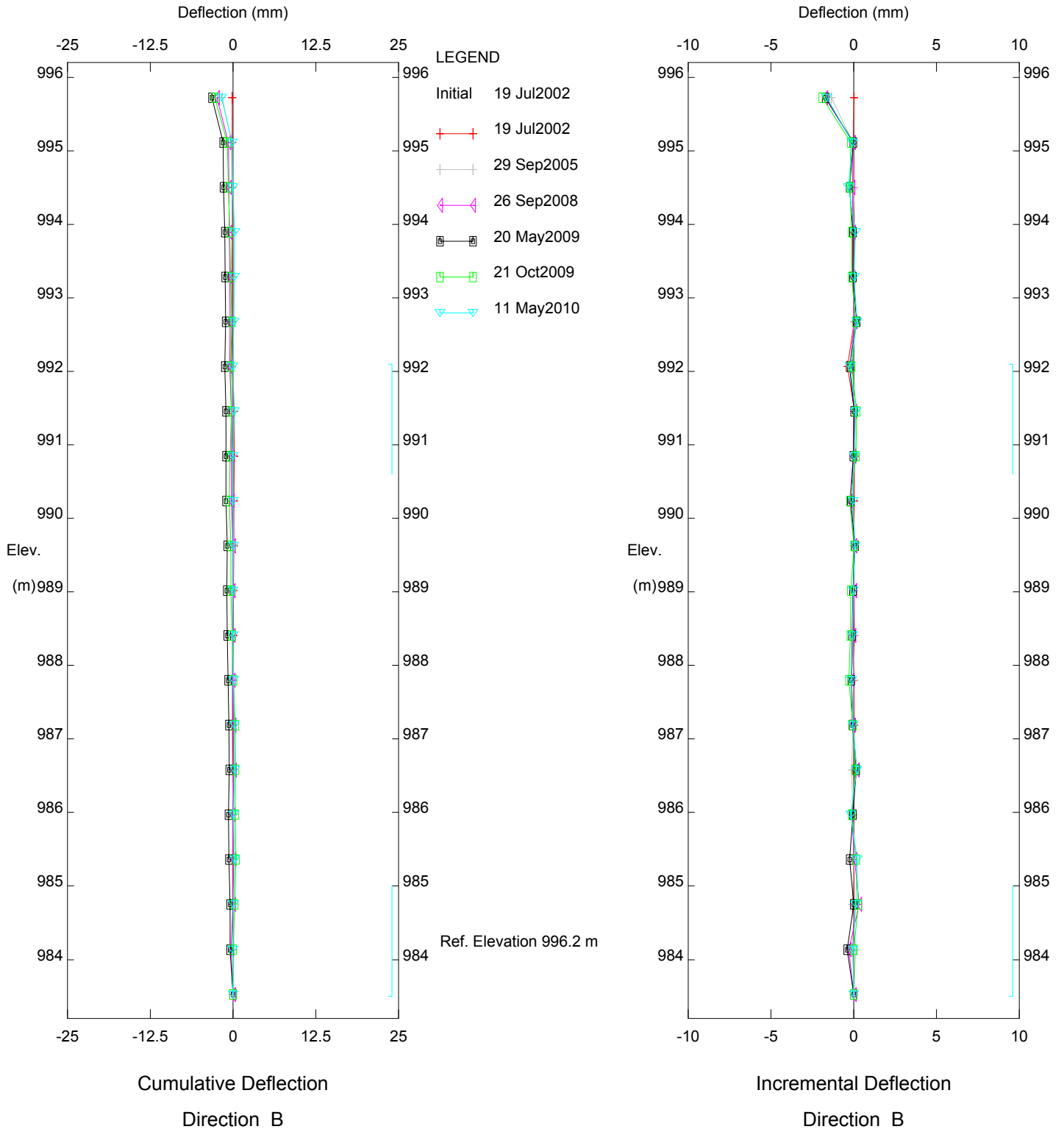


NC19, Inclinometer SI02-1

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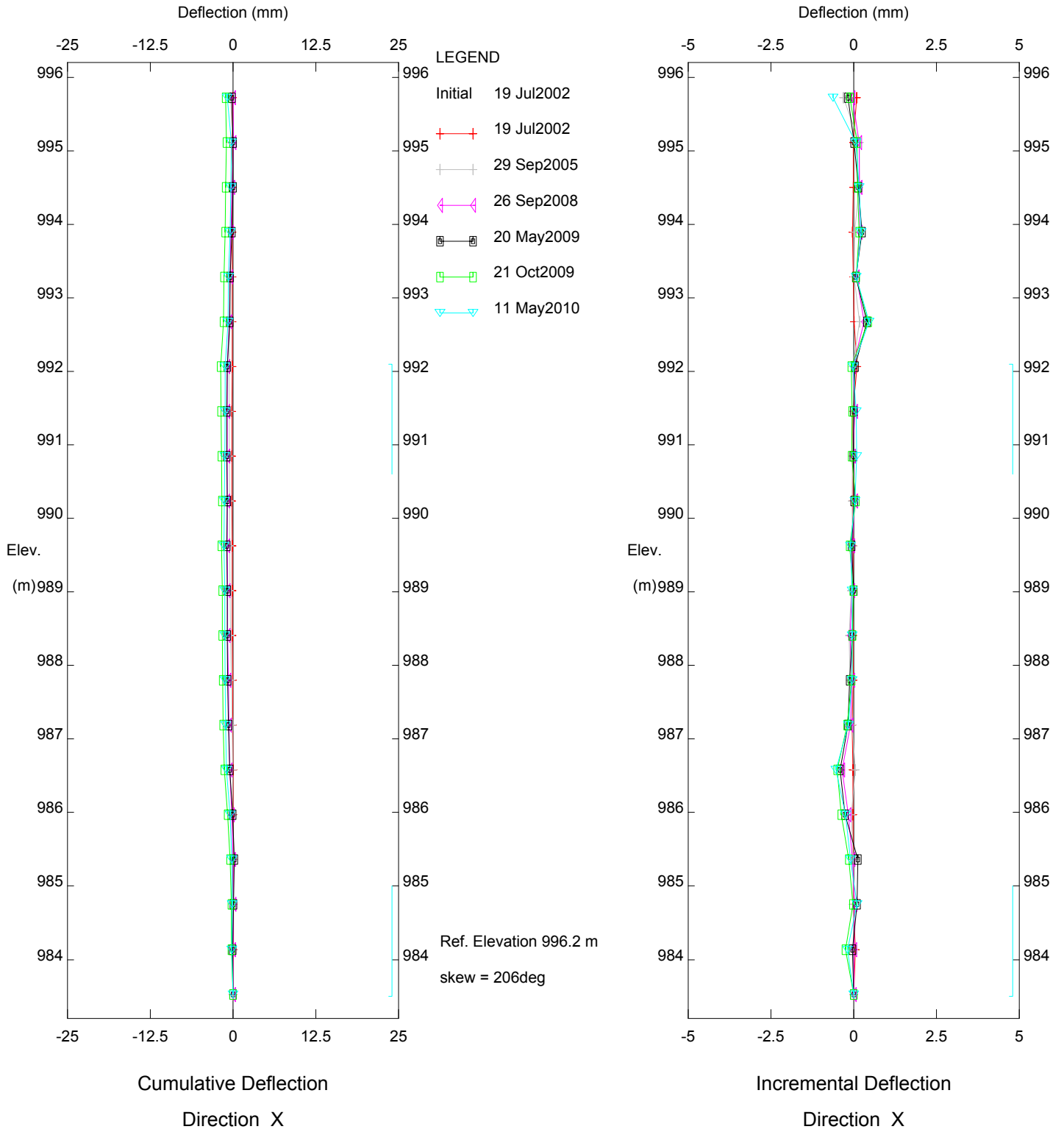


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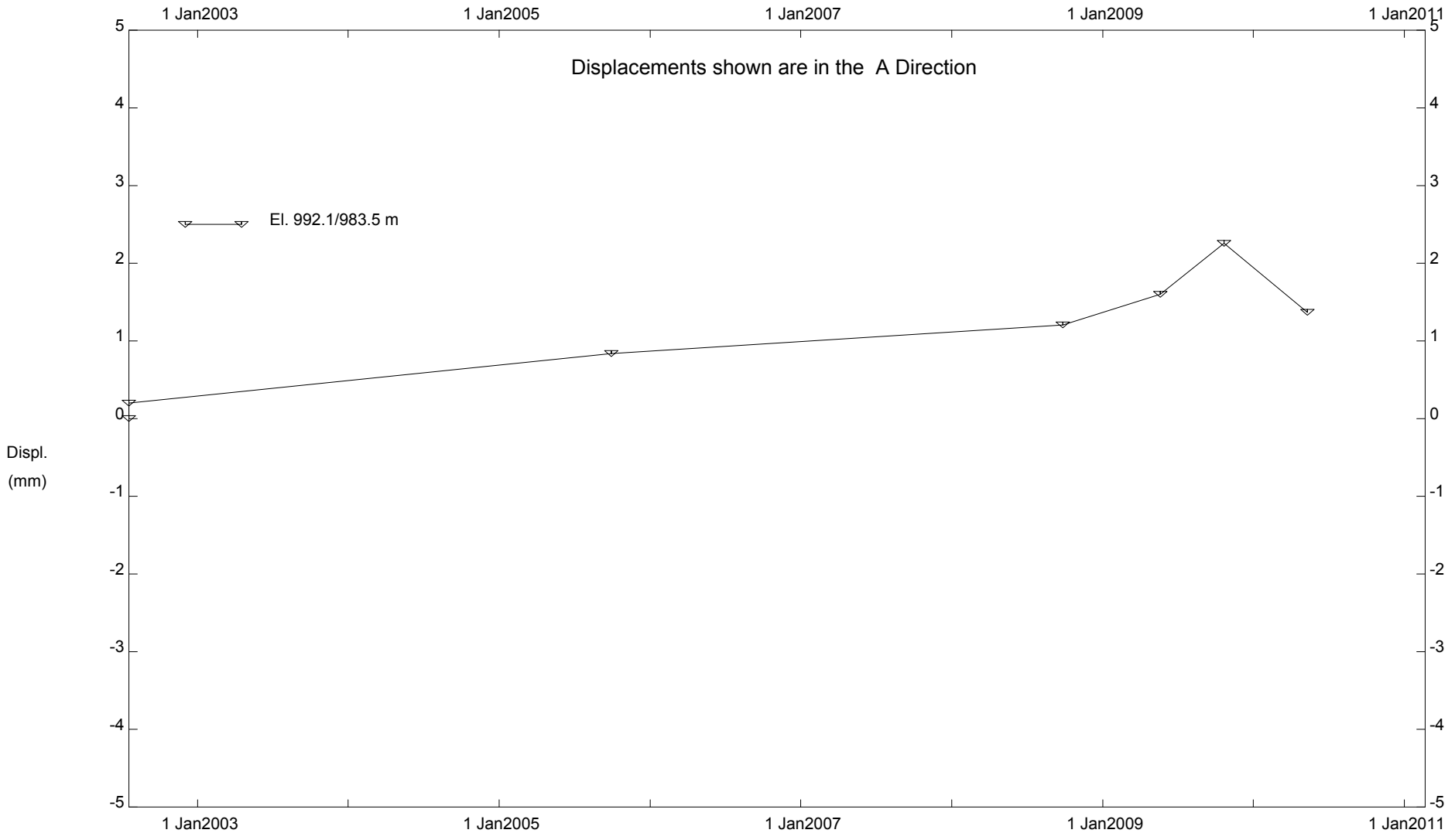


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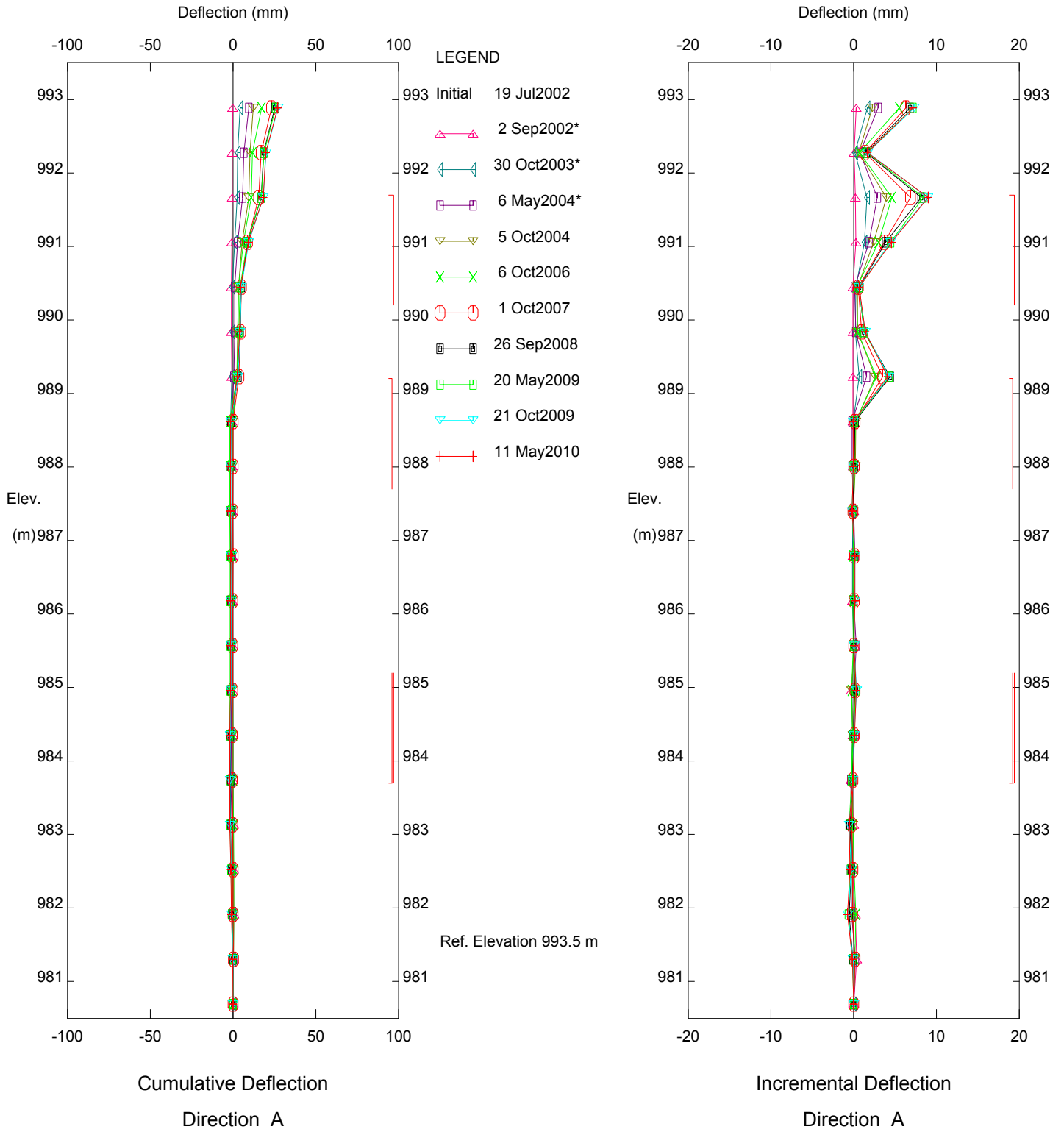
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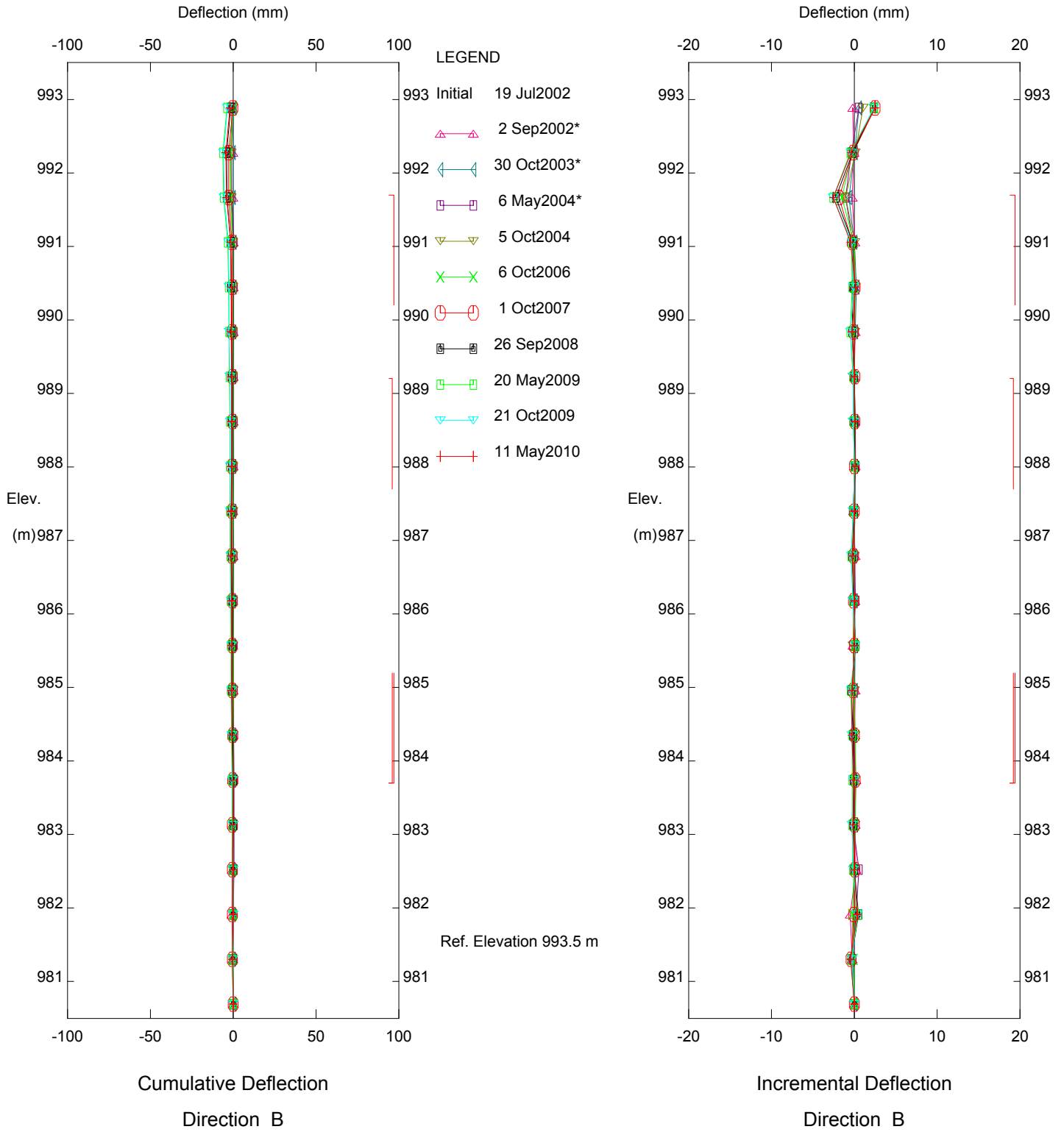
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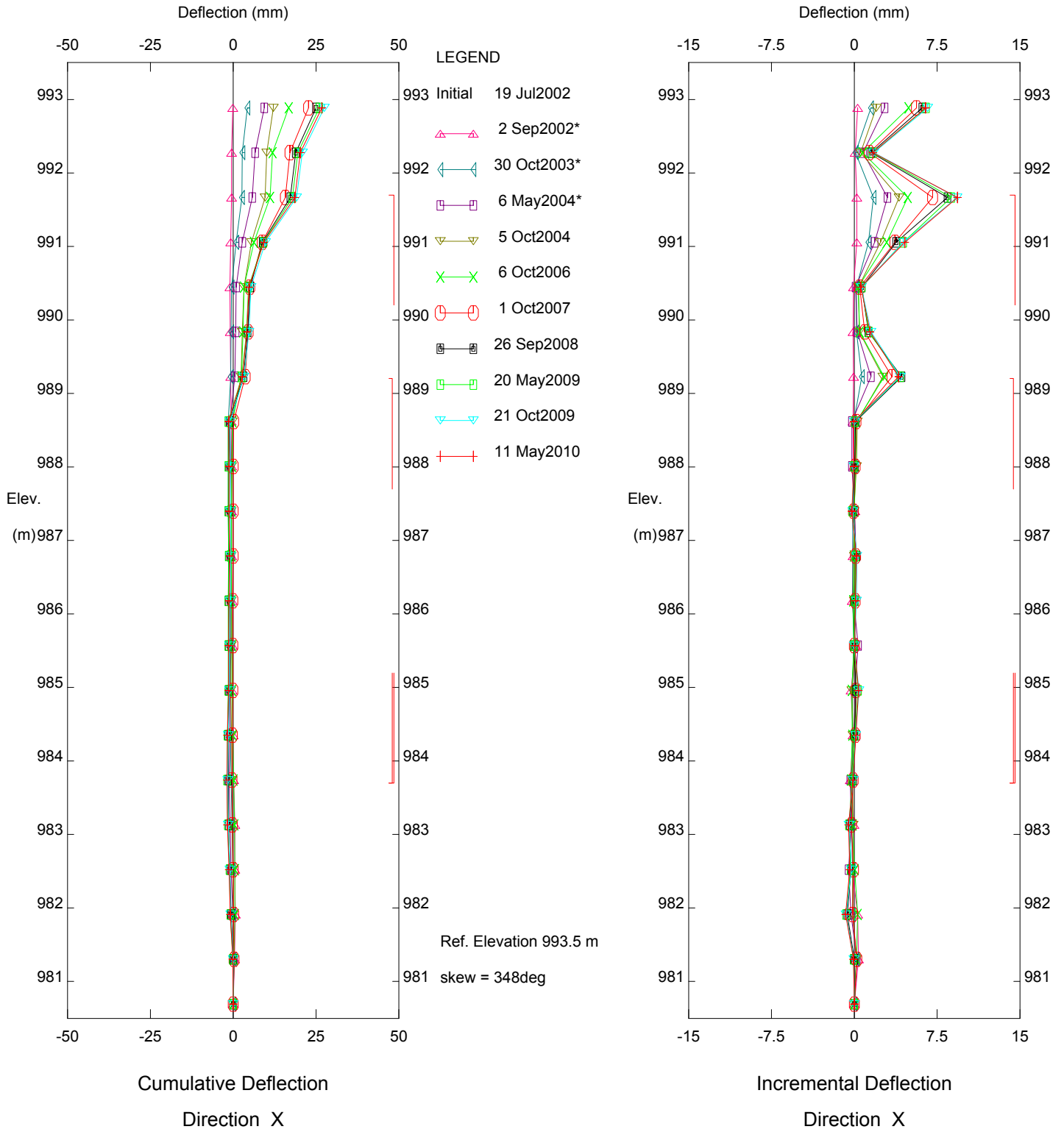
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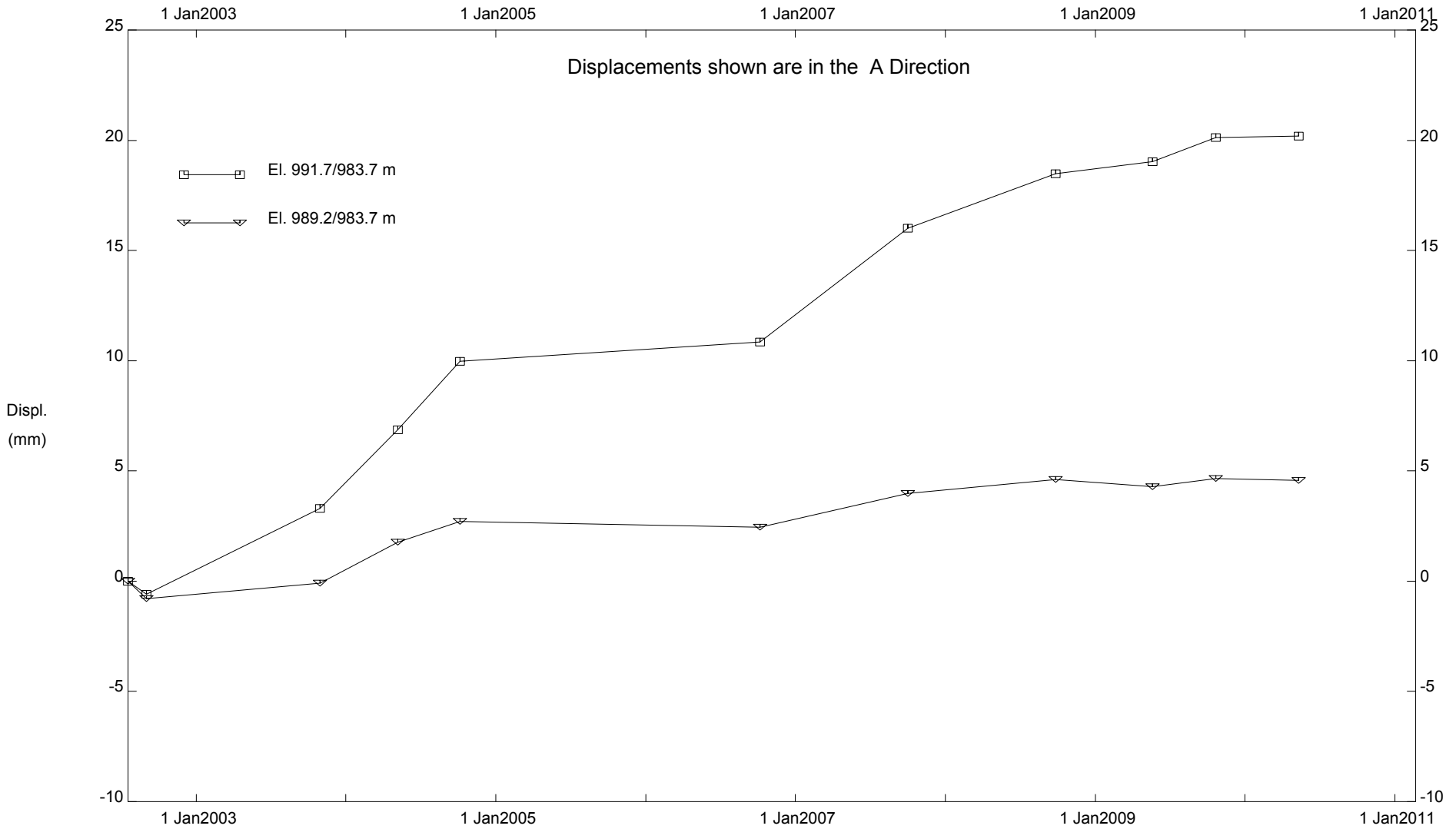
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STANDPIPE / PNEUMATIC PIEZOMETERS PLOT

