



SIRGAS and the earthquake of February 27, 2010 in Chile

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On 27 February 2010, at 06:34 UTC (03:34 local time) an earthquake (magnitude 8.8) shook the western part of Chile. The epicentre was located at 35.846°S and 72.719°W in a depth of about 35 km. In order to estimate the impact of this earthquake in the SIRGAS Reference Frame, daily station positions between February 21 and March 6, 2010 were computed for selected continuously operating SIRGAS stations. This processing includes IGS05 stations located in Europe, North America, Africa, and Antarctica as reference points (Fig. 1).

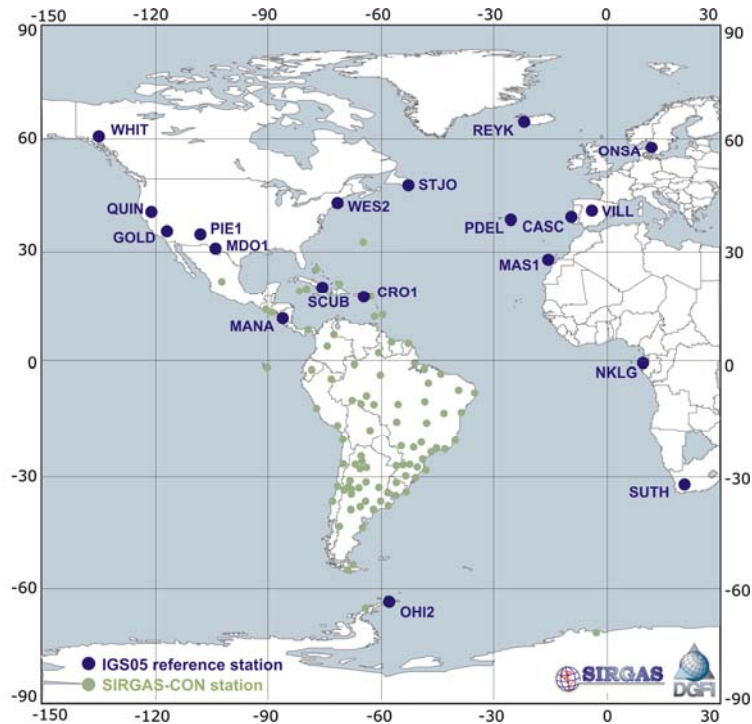


Fig. 1. IGS05 reference stations applied for the datum realization.

The largest displacements occurred between latitudes 30°S to 40°S from the Pacific to the Atlantic coast (Fig. 2). Results show that the station CONZ (Concepción, Chile) initially moved (on 27-02-2010) 2,9 m in the south-west direction. In the week following the first earthquake, additional post-seismic movements of more than 10 cm were detected. Strong vertical displacements are also identified in Concepción, Santiago, Valparaíso and the Province of Mendoza in Argentina (Fig. 3). Stations located in the west of the Andes moved down, stations located in the east moved up. More details are available

In summary, 23 SIRGAS-CON reference stations moved more than 1,5 cm (Table 1): ANTC (Antuco, Chile), AZUL (Azul, Argentina), BCAR (Balcarce, Argentina), CFAG (Caucete, Argentina), CONZ (Concepción, Chile), CSLO (Complejo Astronómico El Leoncito, Argentina), IGM1 (Buenos Aires, Argentina), LHCL (Lihuel Calel, Argentina), LPGS (La Plata, Argentina), MA01 (Neuquen, Argentina), MZAS (San Rafael, Argentina), MZAC (Mendoza, Argentina), MZAE (Santa Rosa, Mendoza, Argentina), RWSN (Rawson, Argentina), SANT (Santiago, Chile), SL01 (La Punta, Argentina), SRLP (Santa Rosa, La Pampa, Argentina), UCOR (Córdoba, Argentina), UNRO (Rosario, Argentina), UNSJ (San Juan, Argentina), UYMO (Montevideo, Uruguay), VALP (Valparaíso, Chile), VBCA (Bahía Blanca, Argentina). The corresponding time series are enclosed.

These computations were carried out by the SIRGAS Analysis Centre at DGFI (*Deutsches Geodätisches Forschungsinstitut*) and are based on the observation data provided by the IGS (International GNSS Service, www.igs.org) and the Latin American Operation Centres and National Data Centres contributing to the continuously operating network SIRGAS-CON (www.sirgas.org). We deeply acknowledge this support.

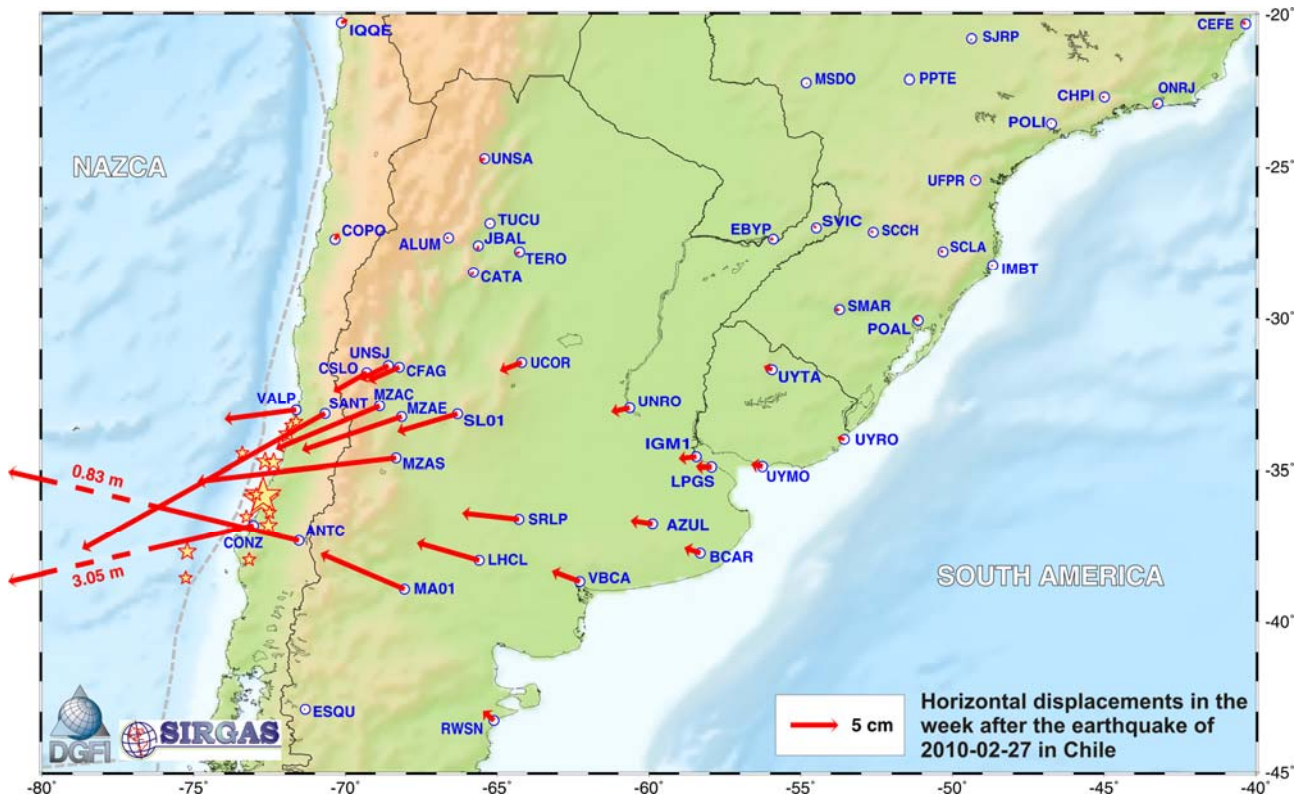


Fig. 2. Horizontal displacements estimated in the week after the earthquake of 2010-02-27 in Chile.

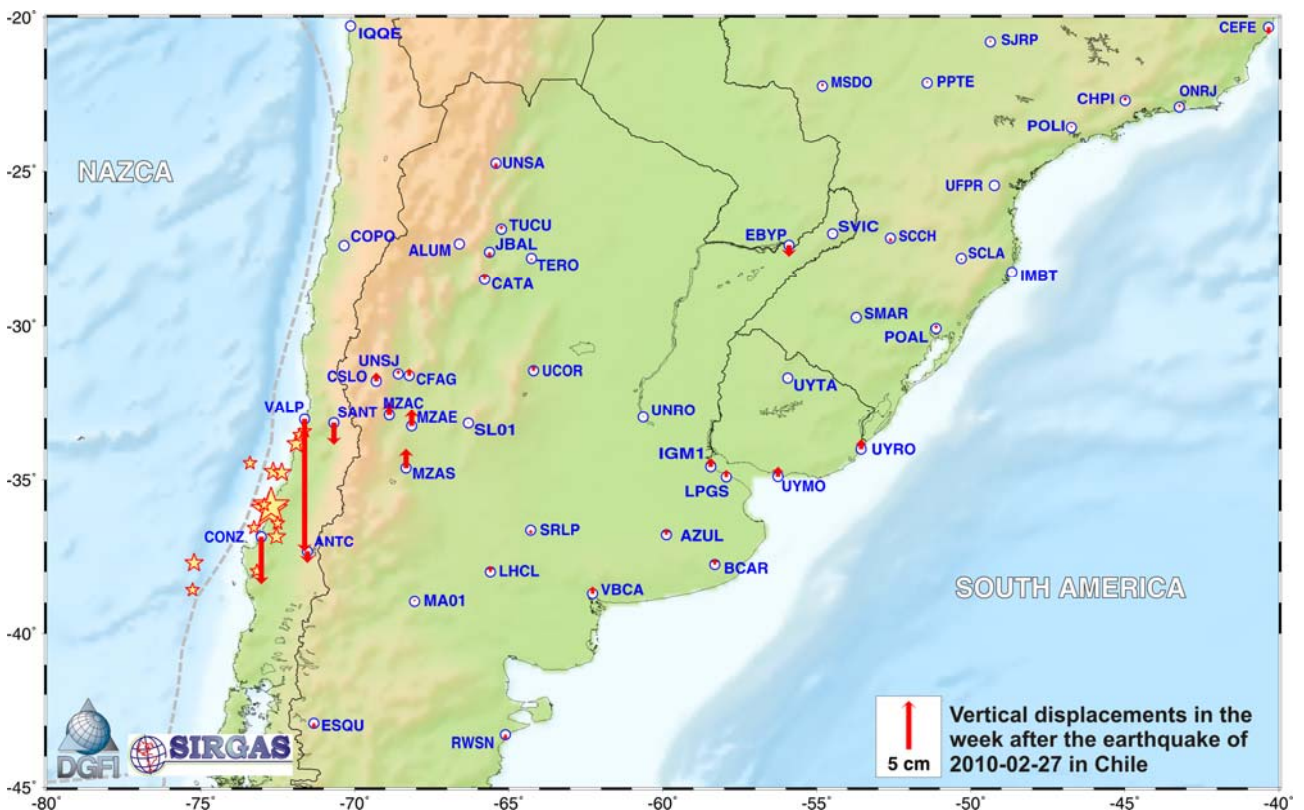


Fig. 3. Vertical displacements estimated in the week after the earthquake of 2010-02-27 in Chile.



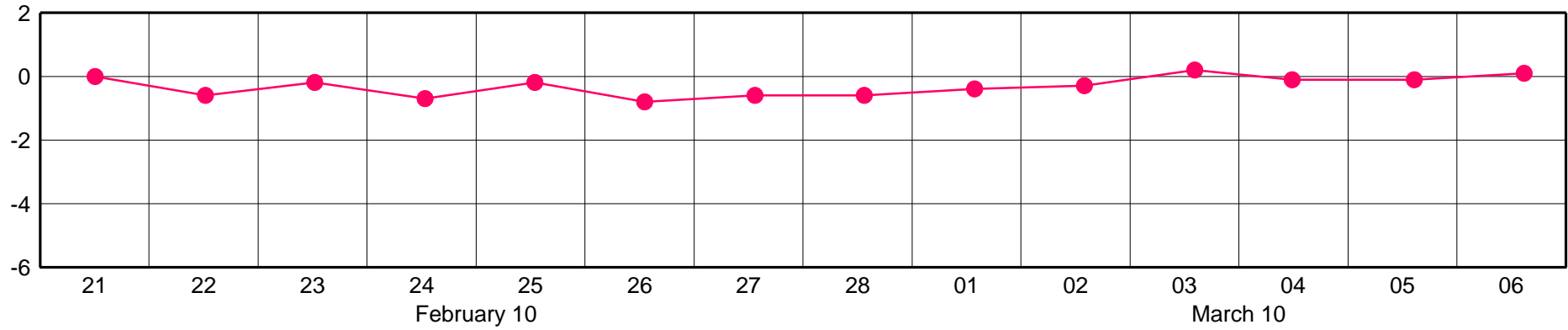
Table 1. Residuals after a similarity transformation between the station positions computed for the GPS weeks 1572 (2010-02-24) and 1573 (2010-03-03).

For the station ANTC, station positions for the week 1539 (2009-07-08) were applied.

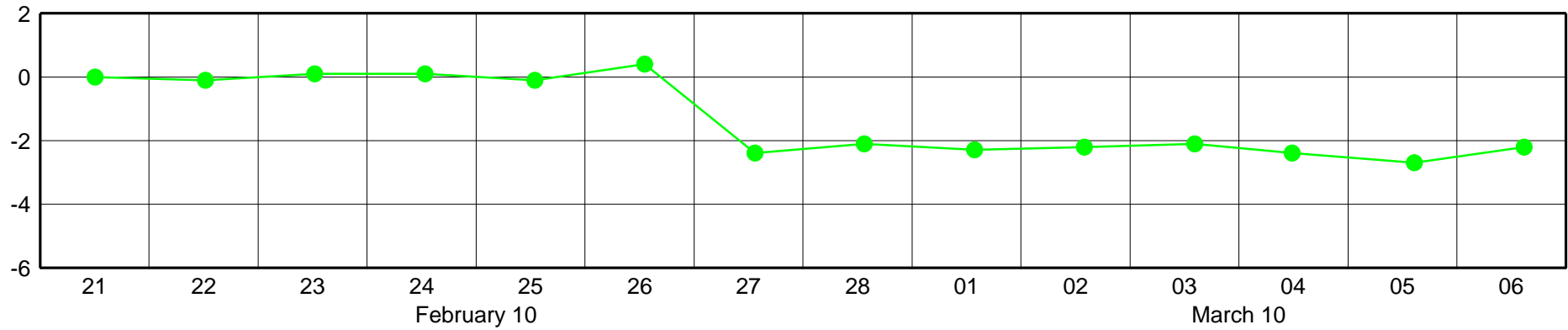
Station	Residuals		
	N [mm]	E [mm]	Up [mm]
ANTC 41713S001	195	-808	-12
AZUL 41529M001	1	-23	3
BCAR 41539M001	3	-16	3
CFAG 41517S001	-18	-33	1
CONZ 41719M002	-682	-2977	-47
CSLO 41540M001	-21	-36	6
IGM1 41505M003	-5	-18	8
LHCL 41518S001	16	-66	4
LPGS 41510M001	-2	-17	-1
MA01 41542M001	37	-83	9
MZAC 41503M001	-48	-109	15
MZAE 41530M001	-39	-105	17
MZAS 41528M001	-27	-210	18
RWSN 41513M001	8	-10	3
SANT 41705M003	-145	-257	-21
SL01 41543M001	-21	-64	1
SRLP 41532M001	3	-58	8
UCOR 41502M001	-11	-22	1
UNRO 41525M001	-7	-19	-3
UNSJ 41527M001	-18	-29	-1
UYMO 42301M001	-1	-11	10
VALP 41712S001	-13	-76	-137
VBCA 41512M001	8	-30	4

AZUL-North [cm]

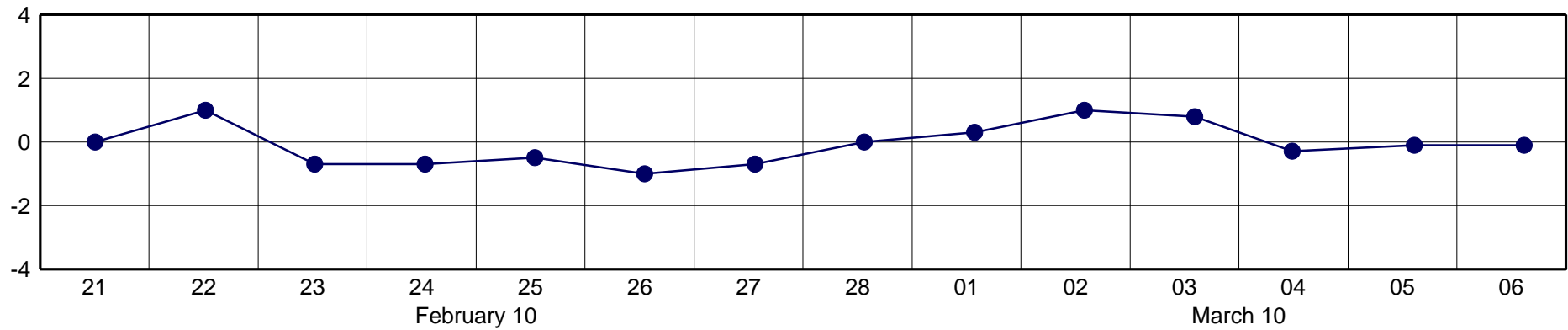
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AZUL-East [cm]

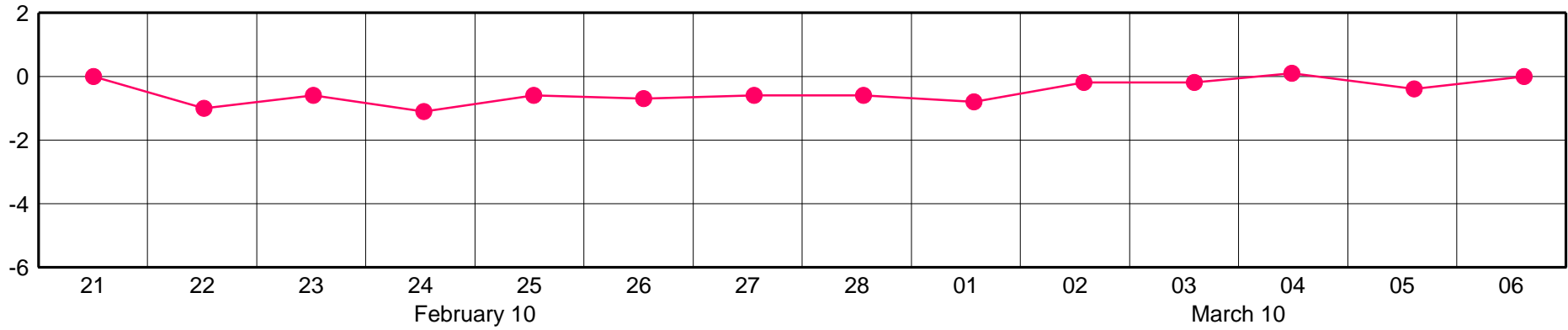


AZUL-Up [cm]

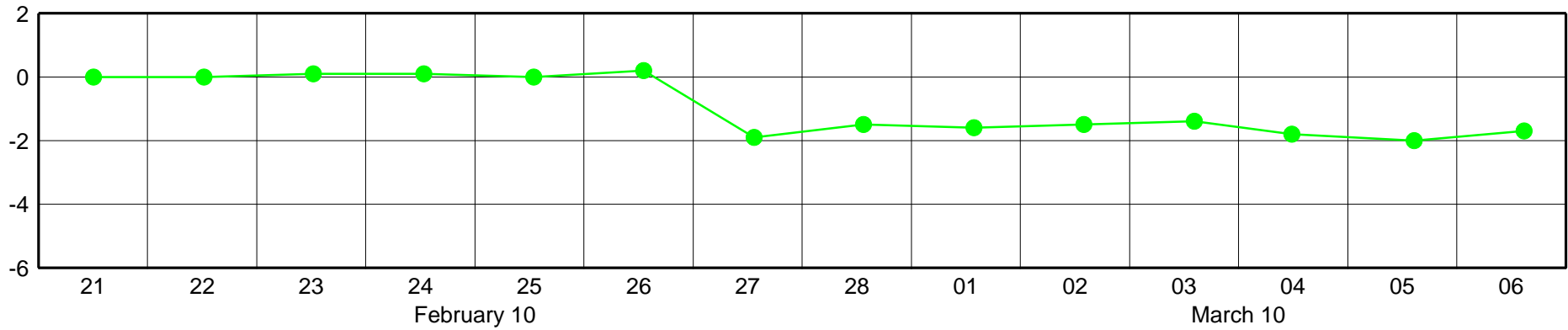


BCAR-North [cm]

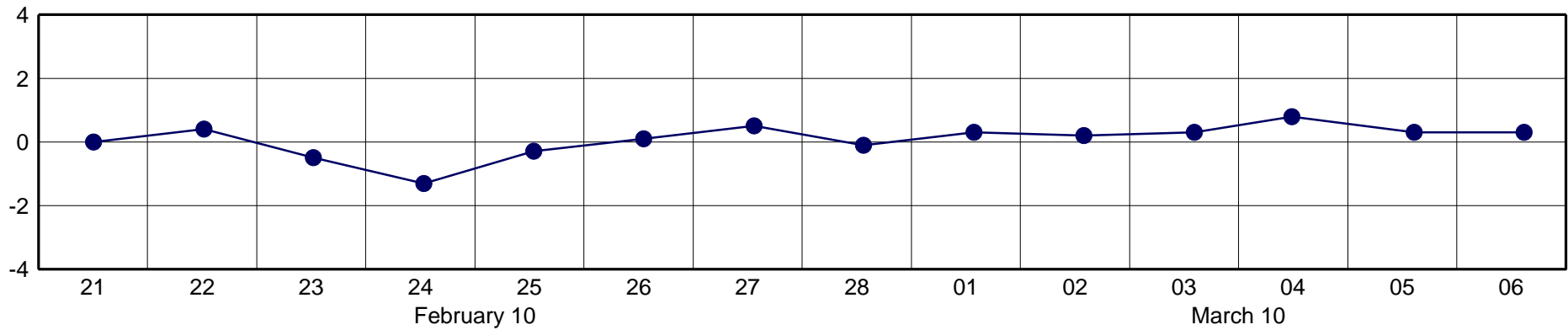
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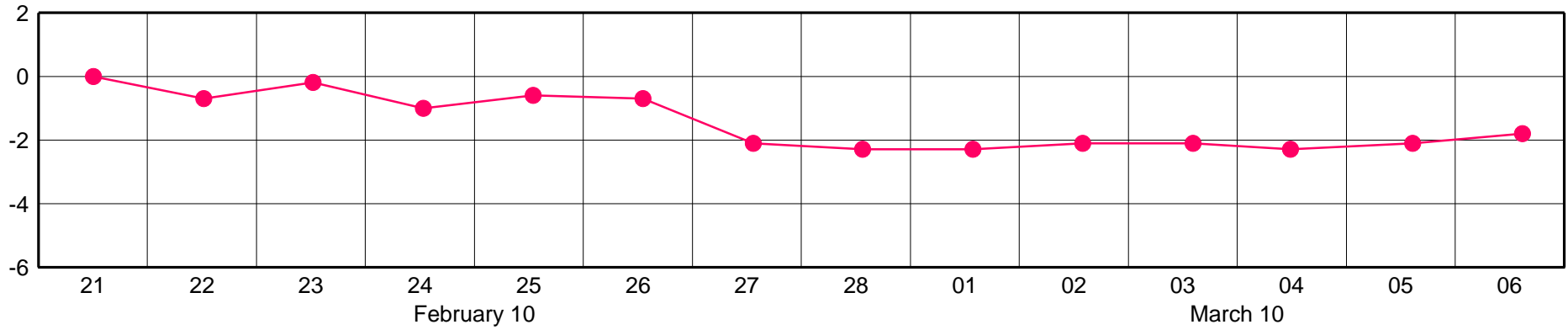


BCAR-Up [cm]

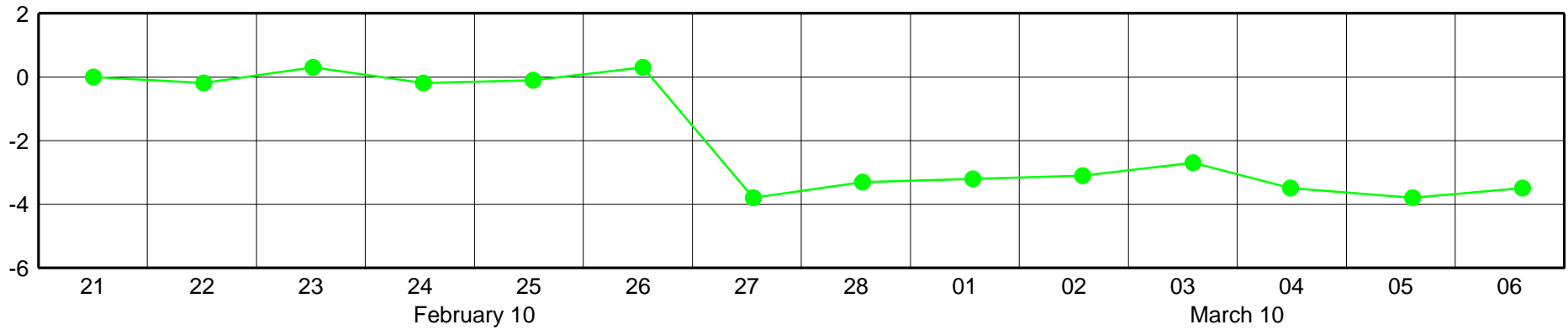


CFAG-North [cm]

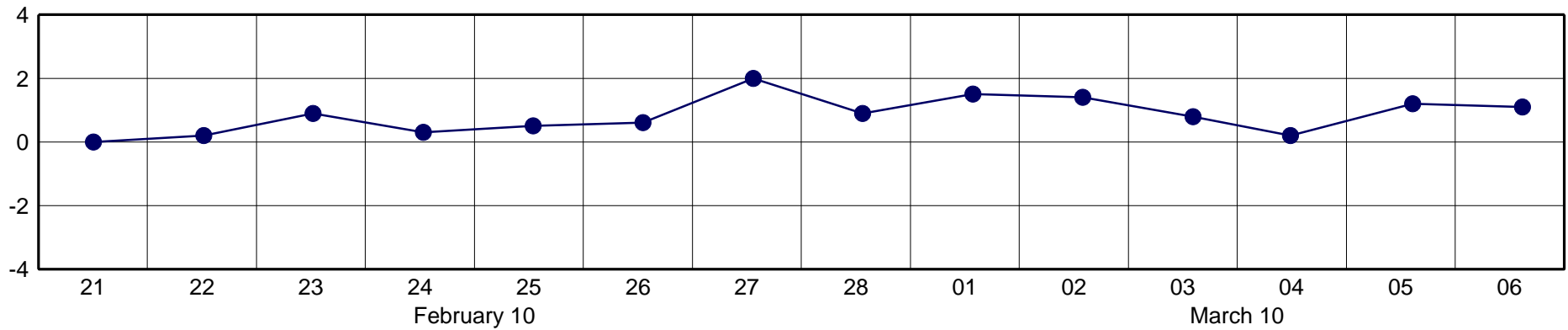
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CFAG-East [cm]

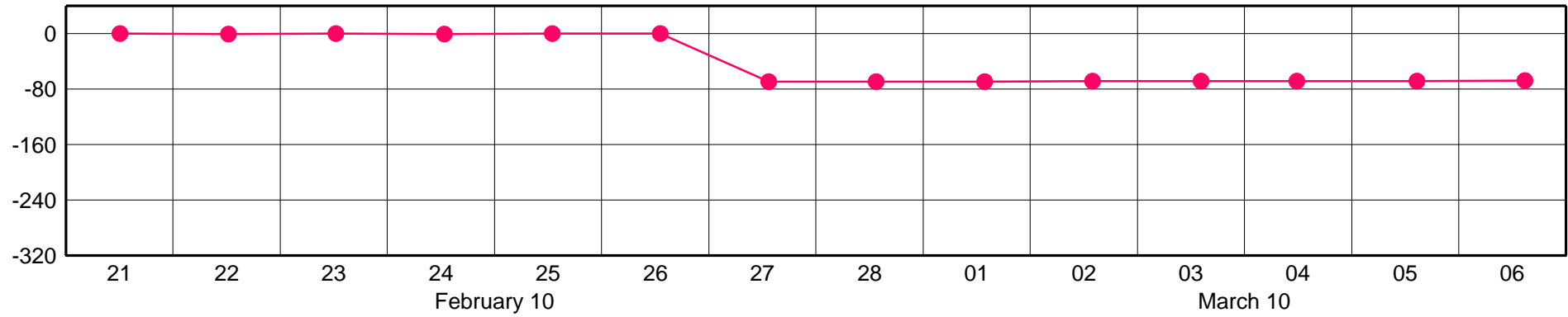


CFAG-Up [cm]

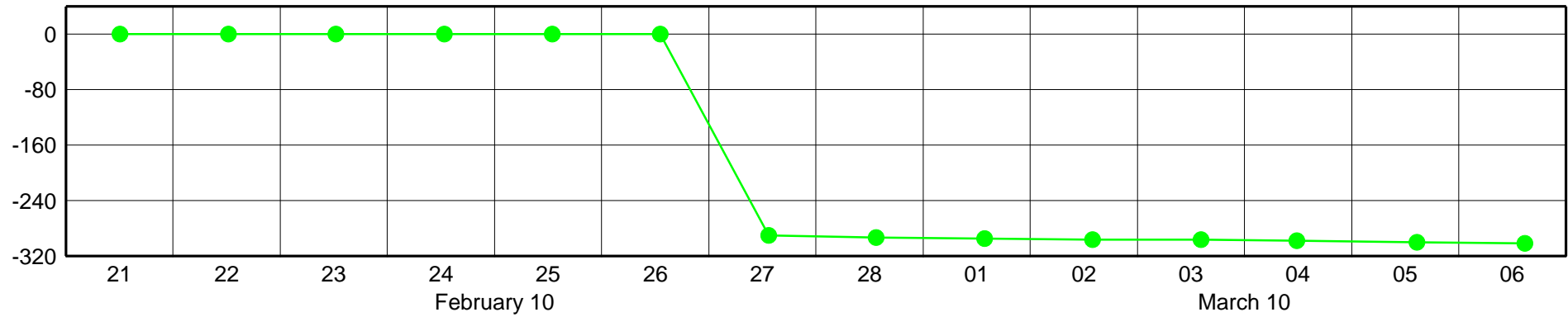


CONZ-North [cm]

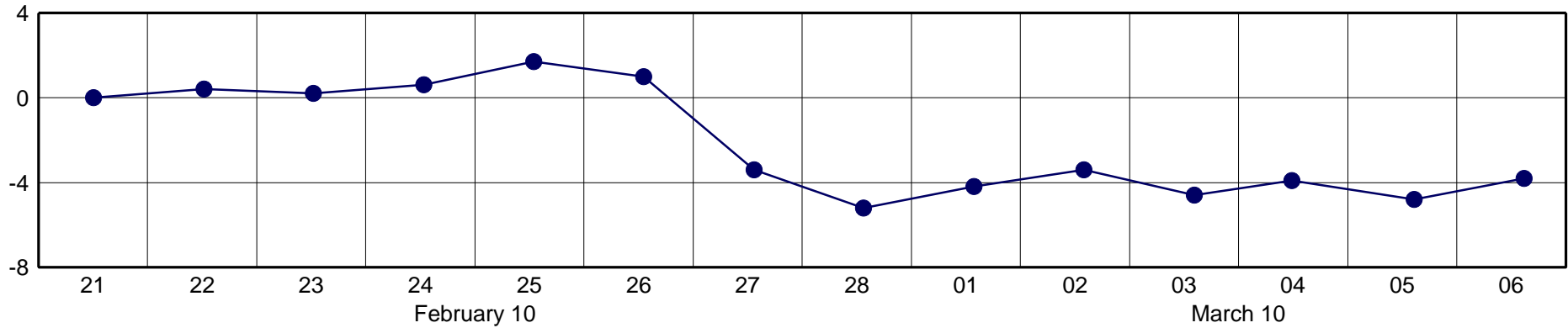
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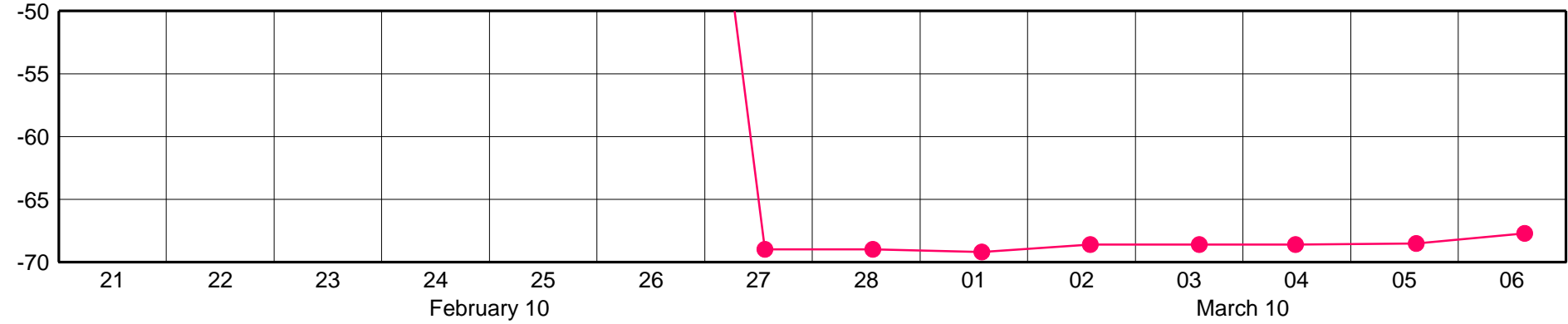
CONZ-East [cm]



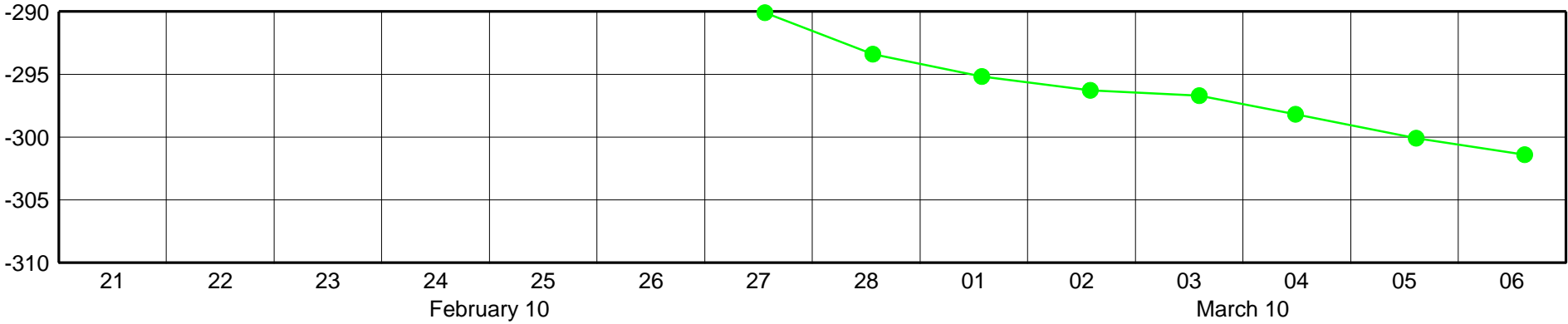
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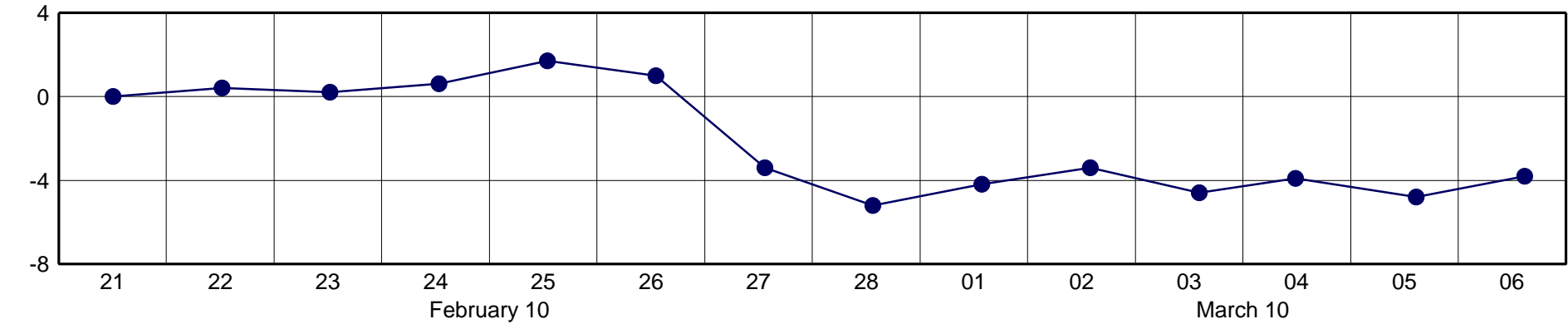
CONZ-North [cm]



CONZ-East [cm]

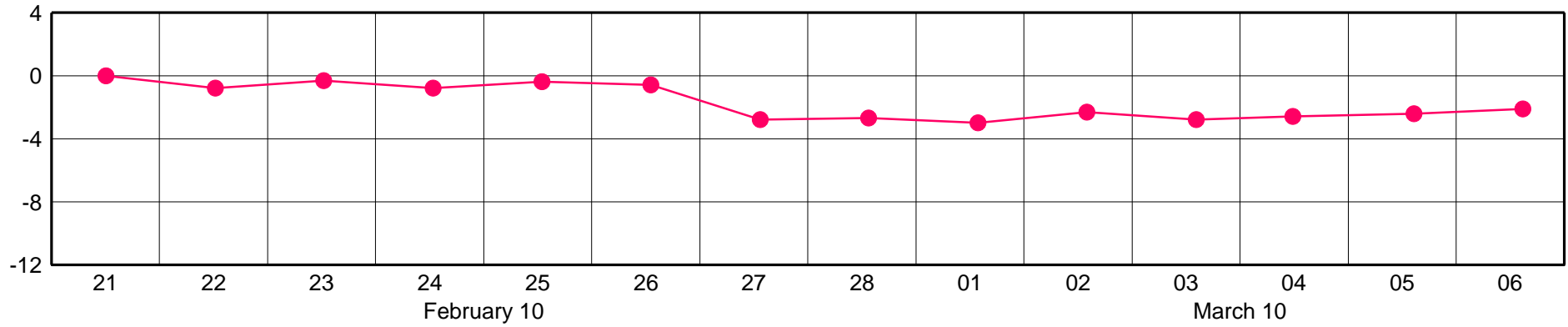


CONZ-Up [cm]

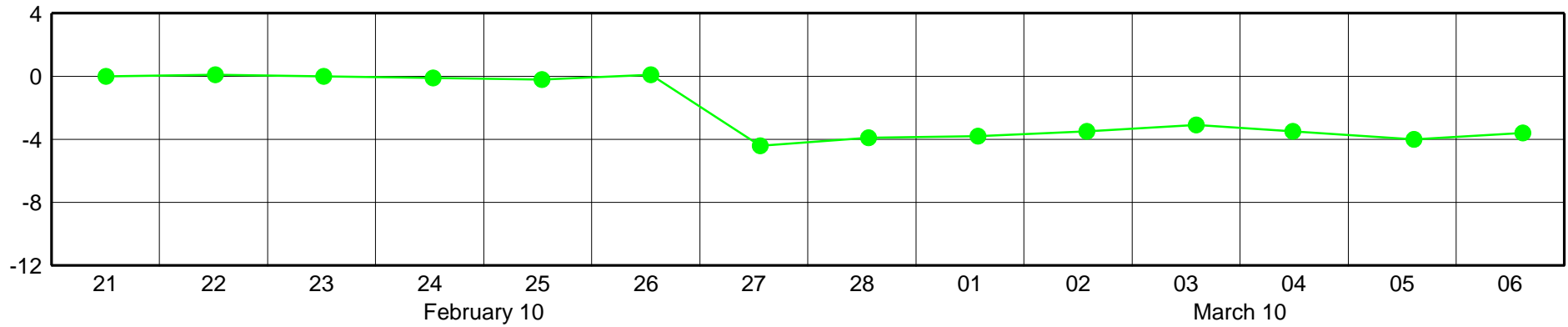


CSLO-North [cm]

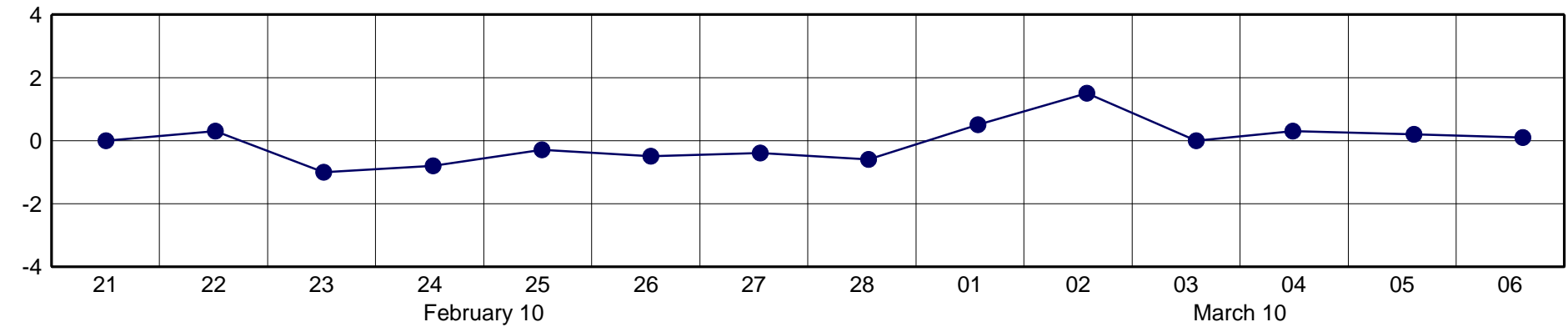
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CSLO-East [cm]

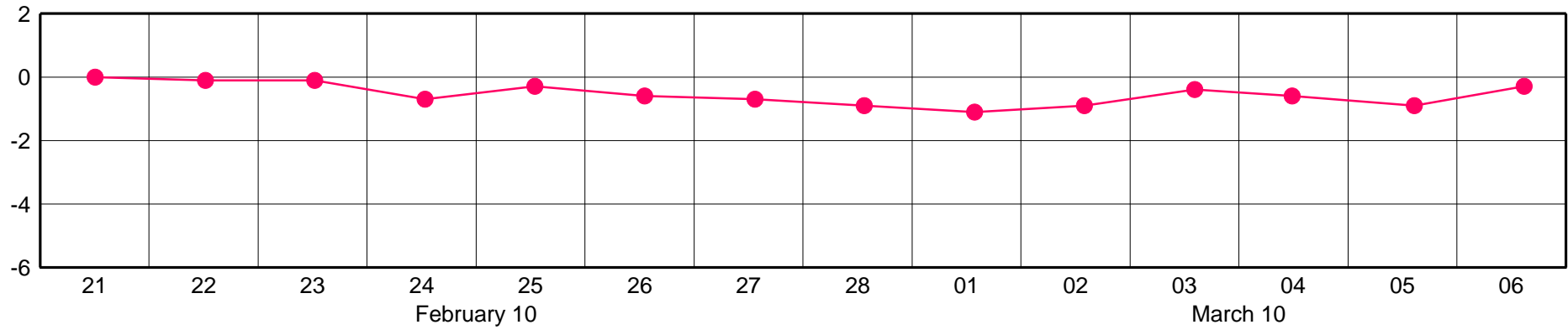


CSLO-Up [cm]

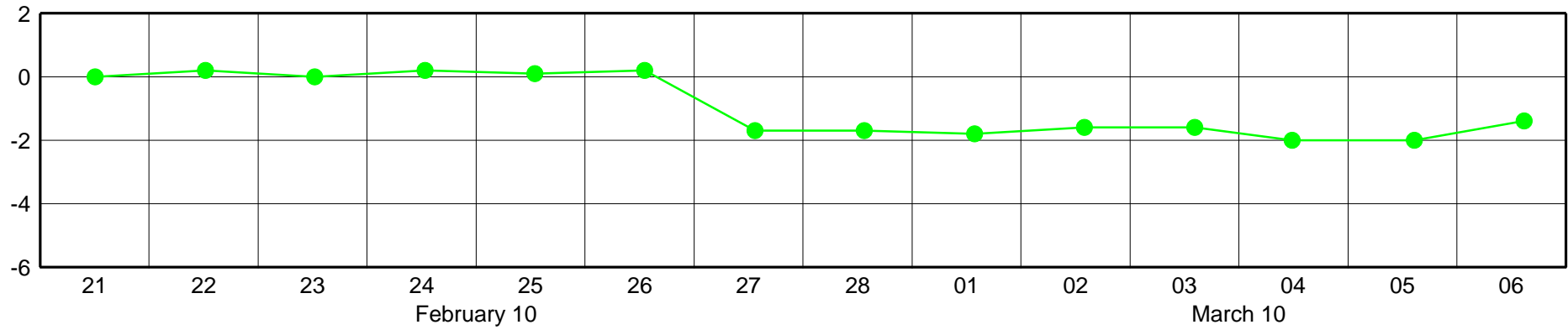


IGM1-North [cm]

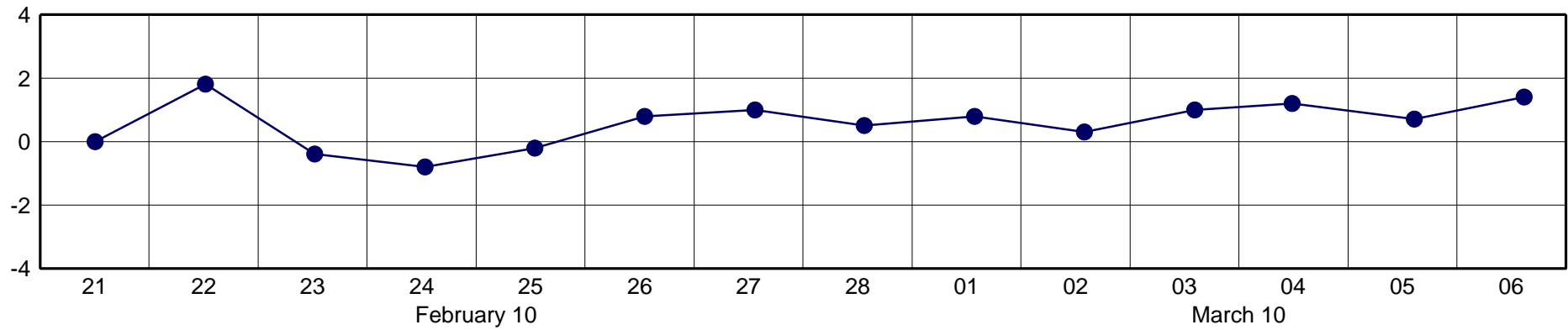
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IGM1-East [cm]

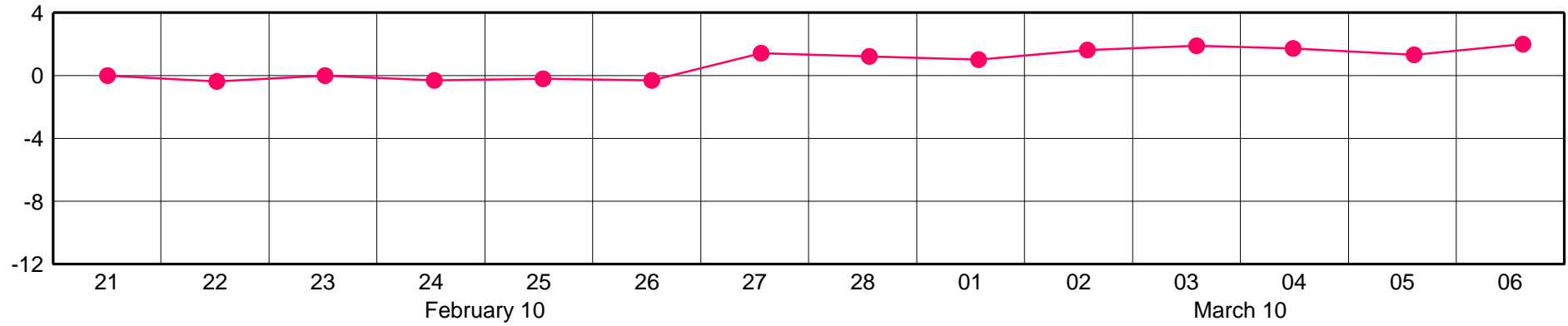


IGM1-Up [cm]

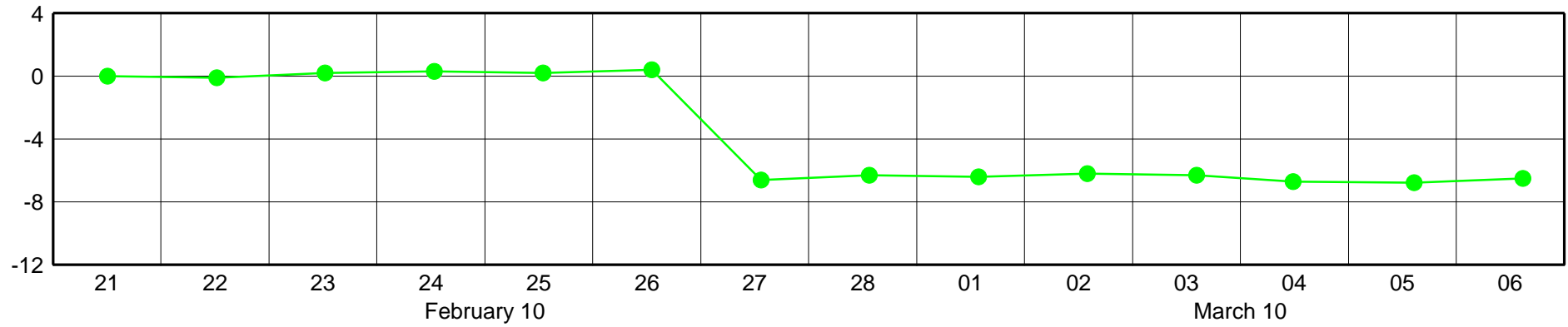


LHCL-North [cm]

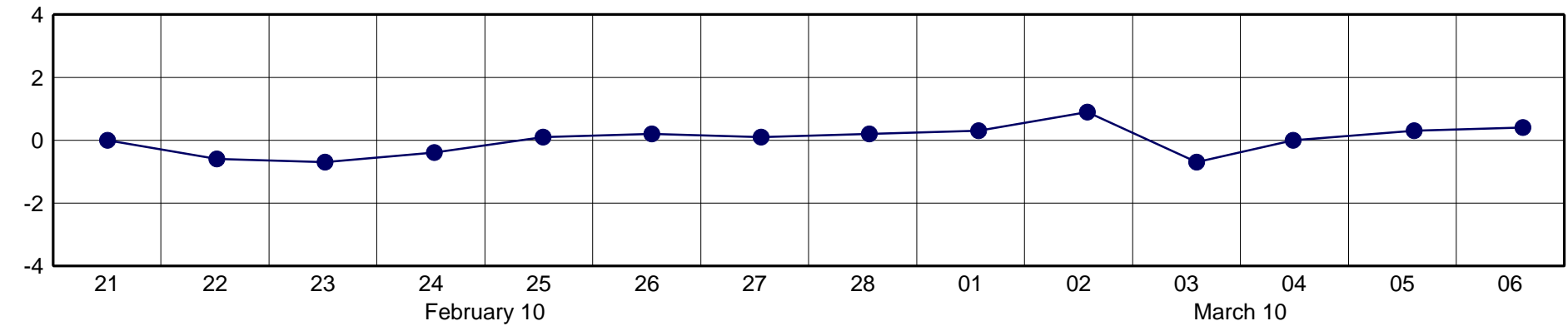
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LHCL-East [cm]

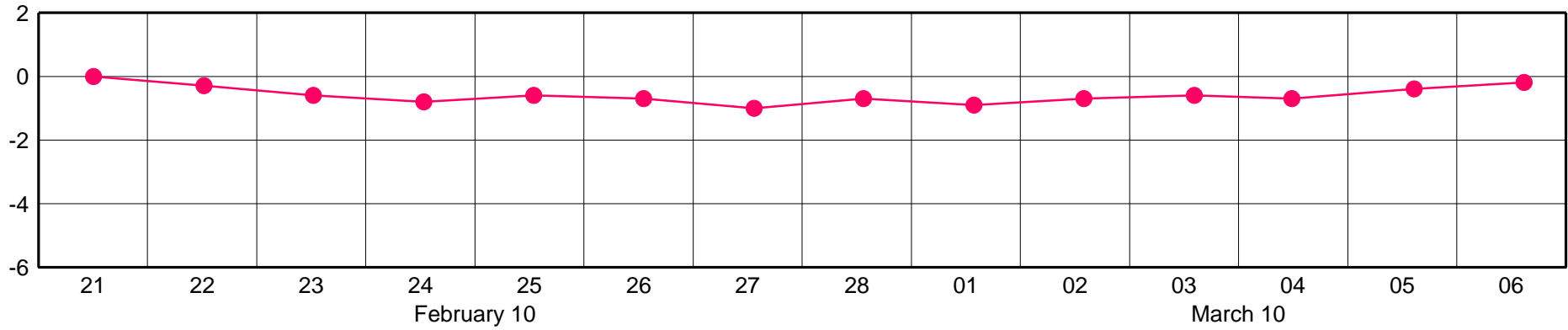


LHCL-Up [cm]

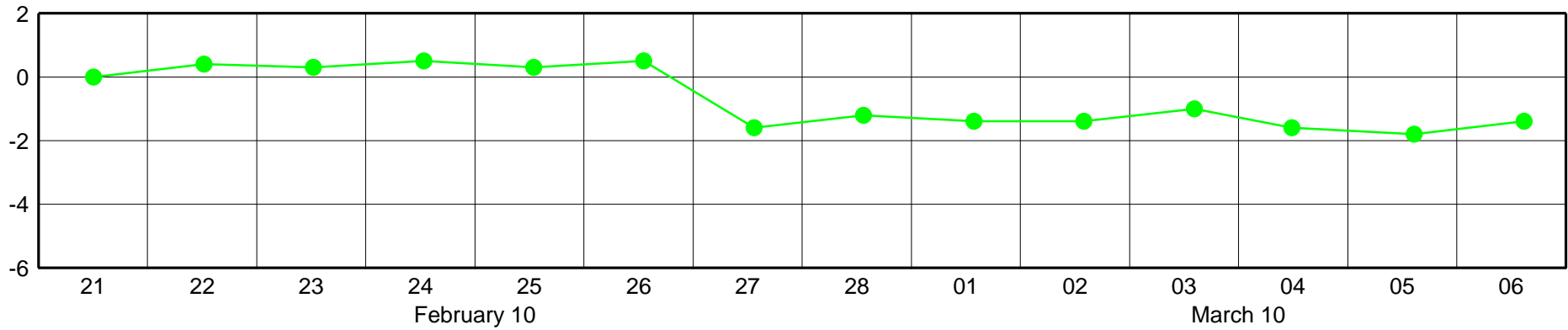


LPGS-North [cm]

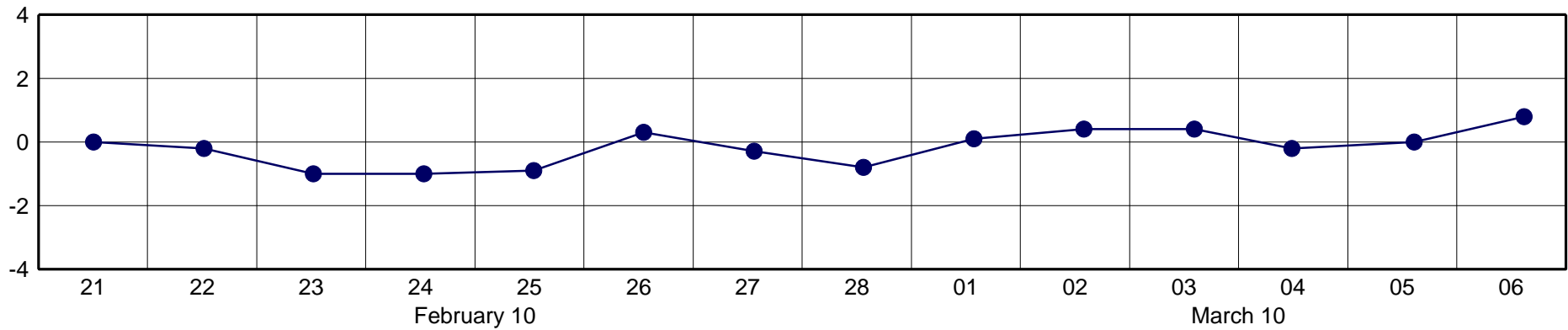
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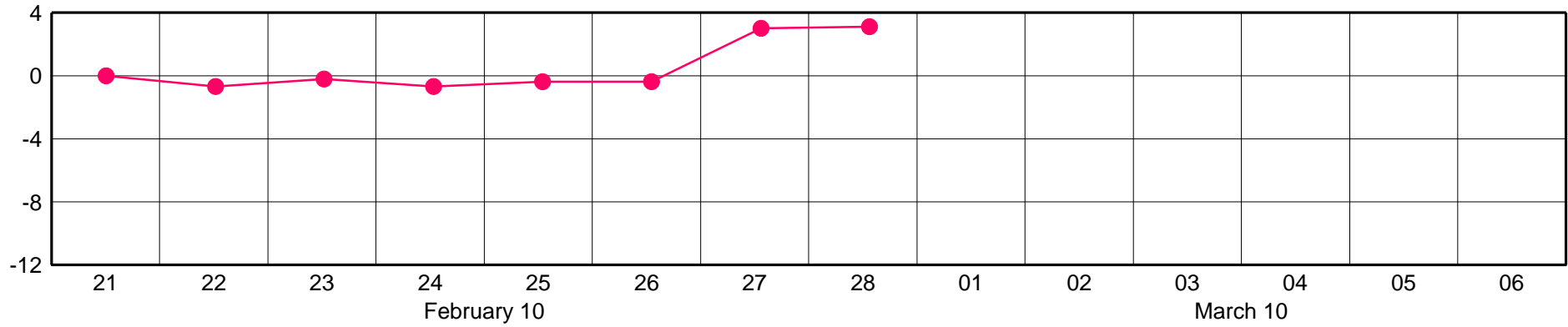
LPGS-East [cm]



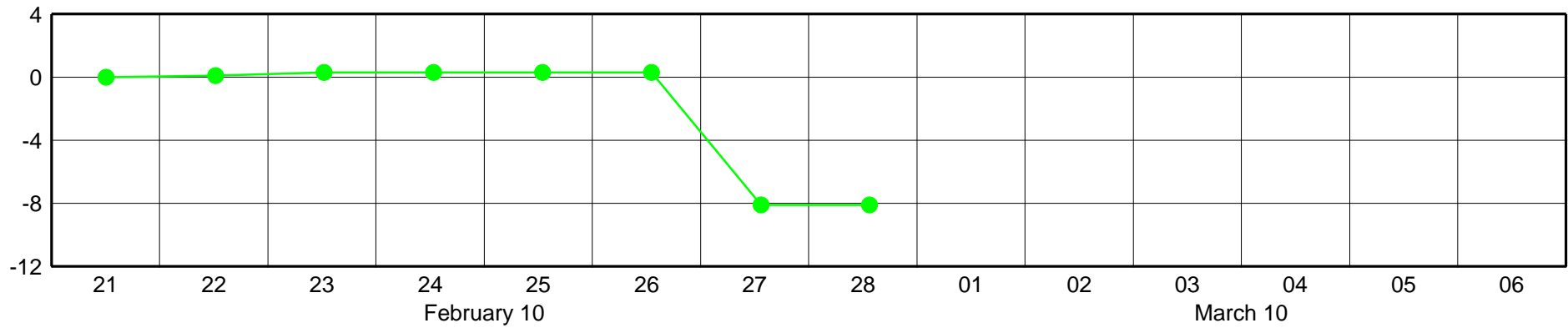
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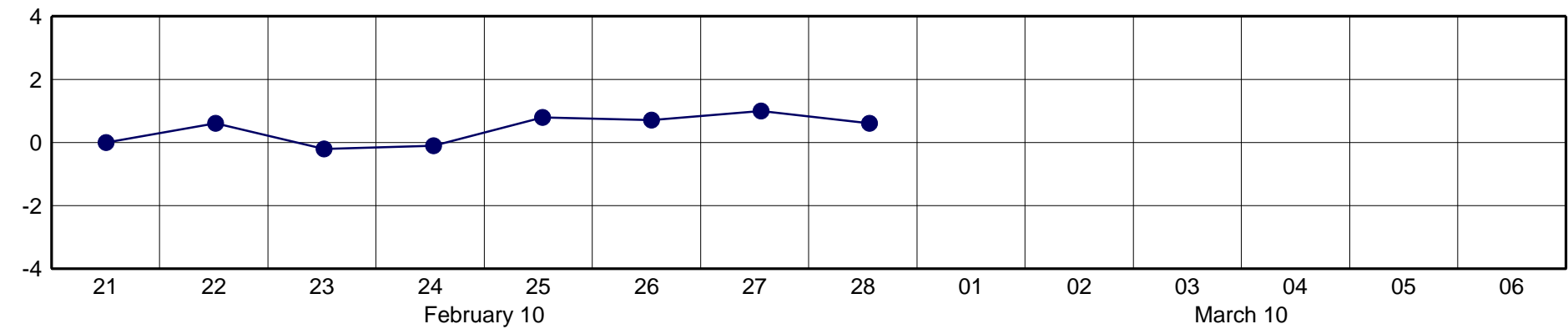
MA01-North [cm]



MA01-East [cm]

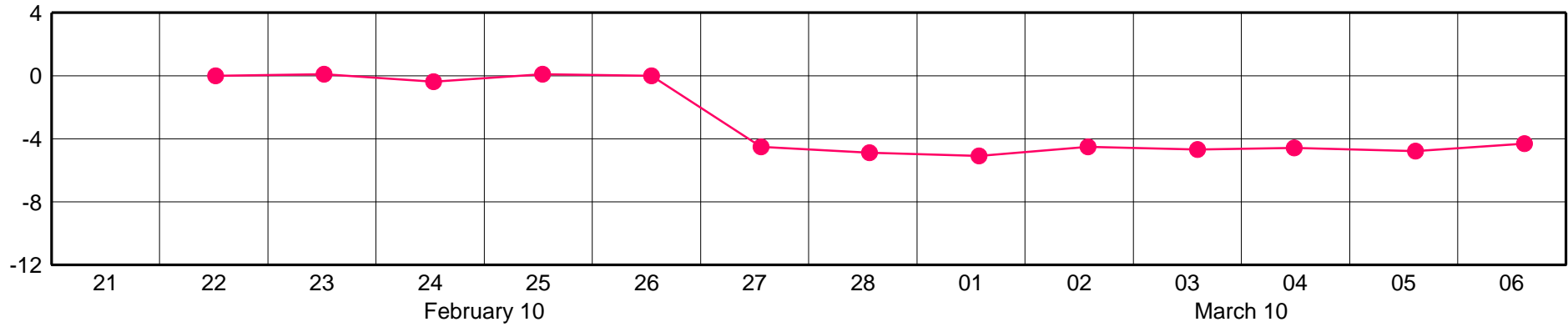


MA01-Up [cm]

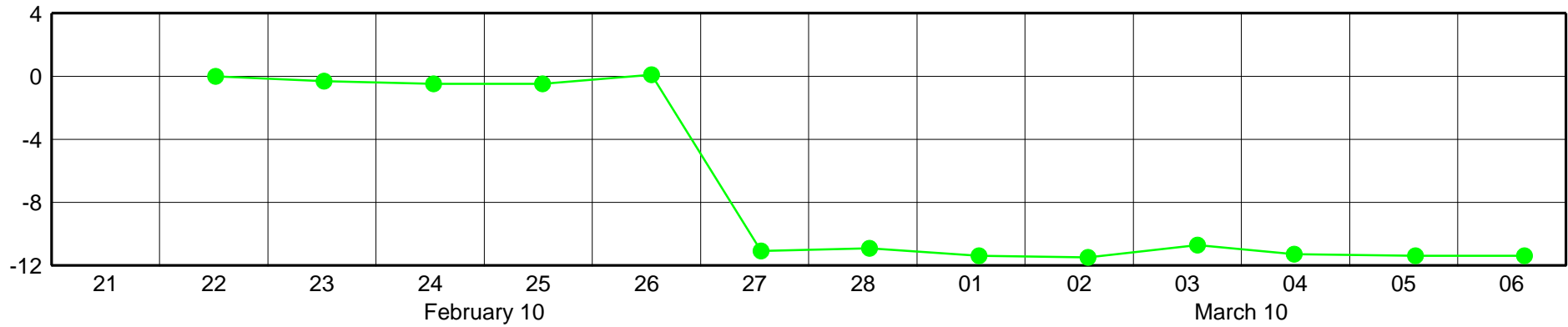


MZAC-North [cm]

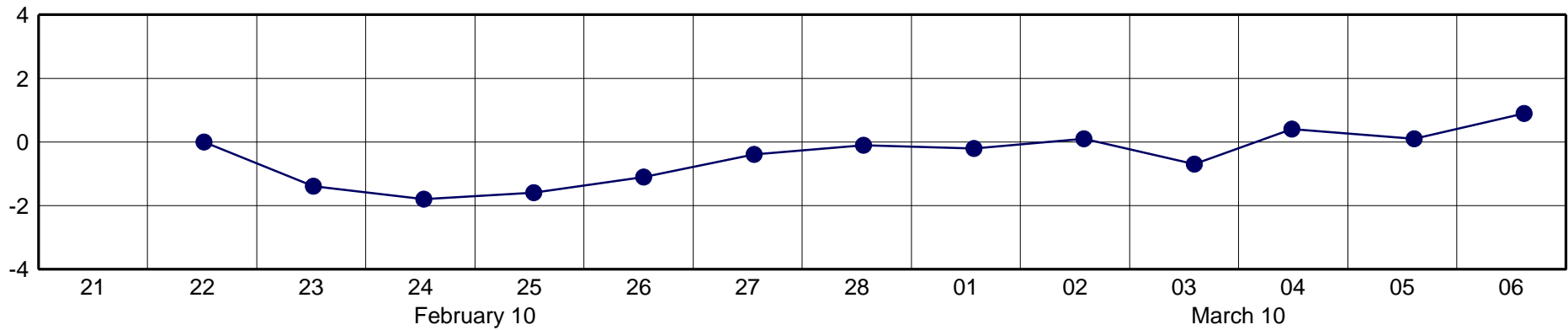
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MZAC-East [cm]

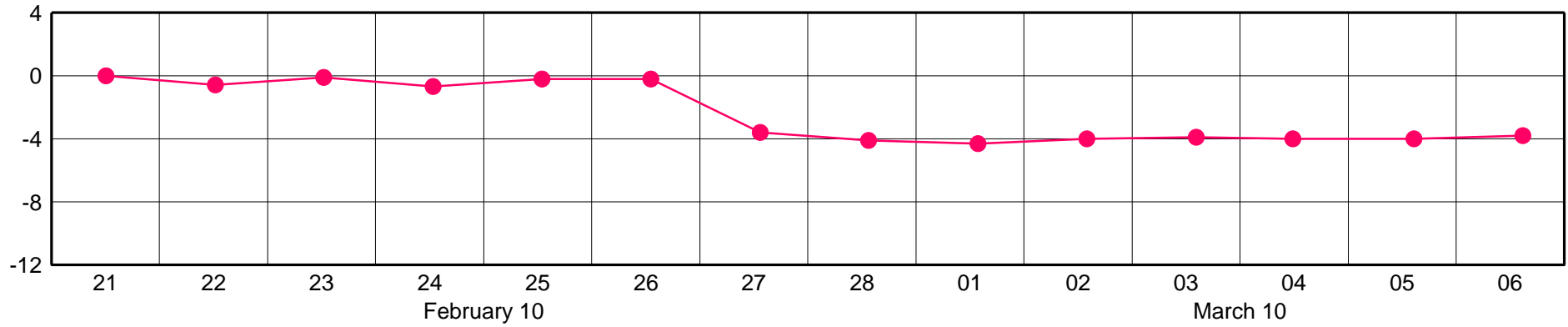


MZAC-Up [cm]

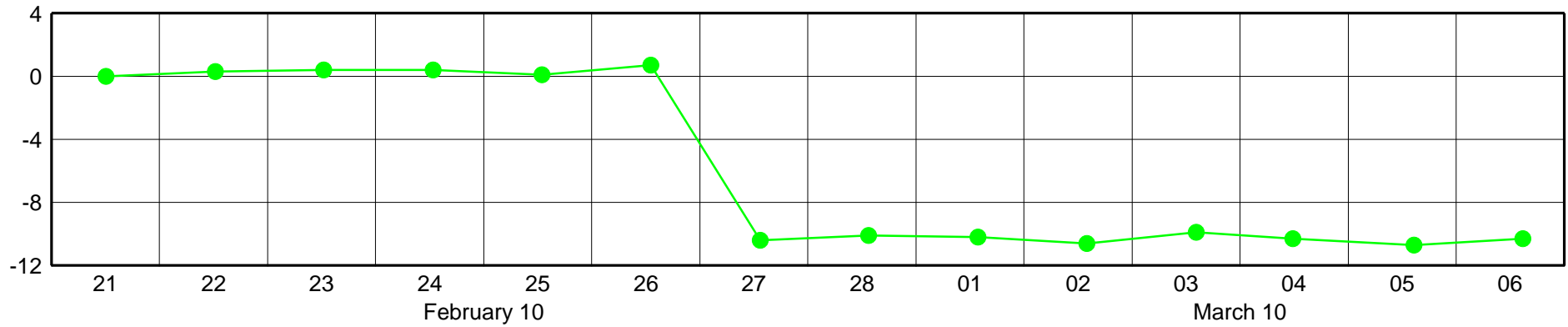


MZAE-North [cm]

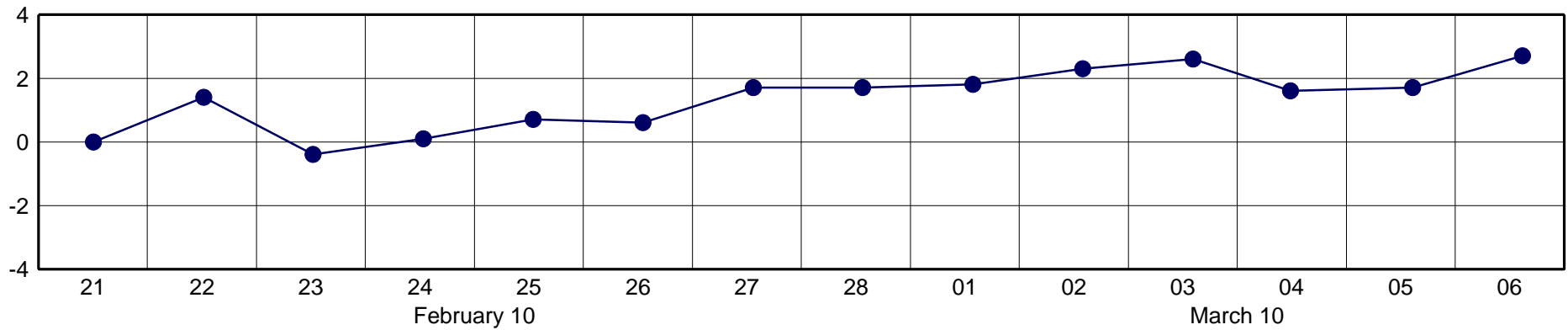
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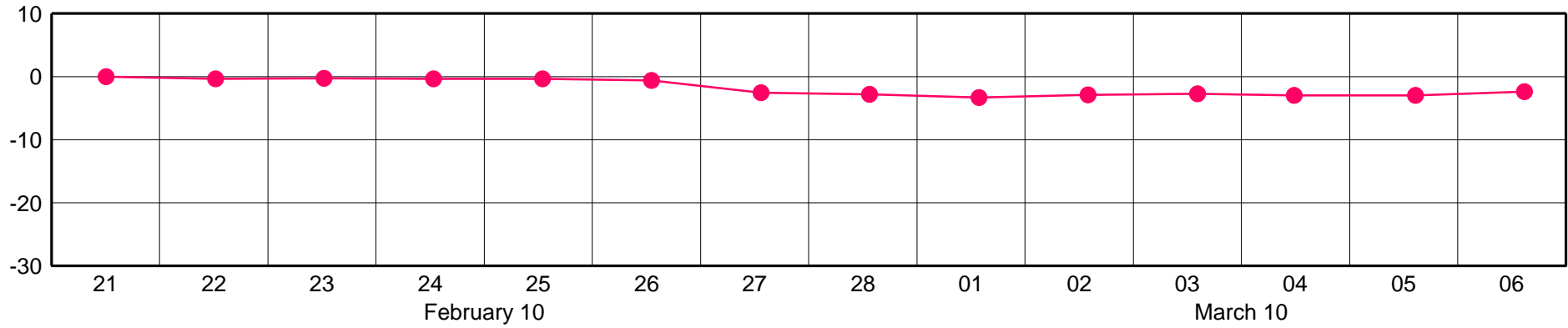


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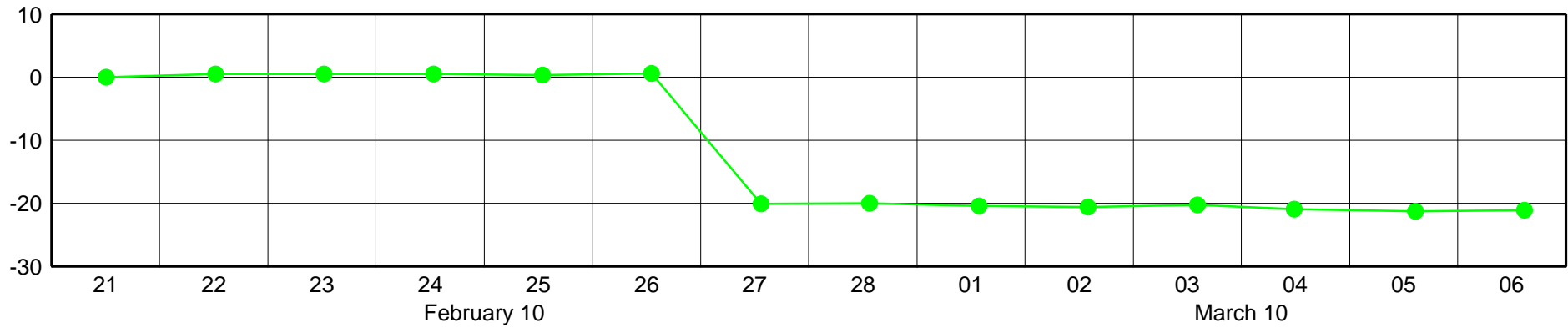


MZAS-North [cm]

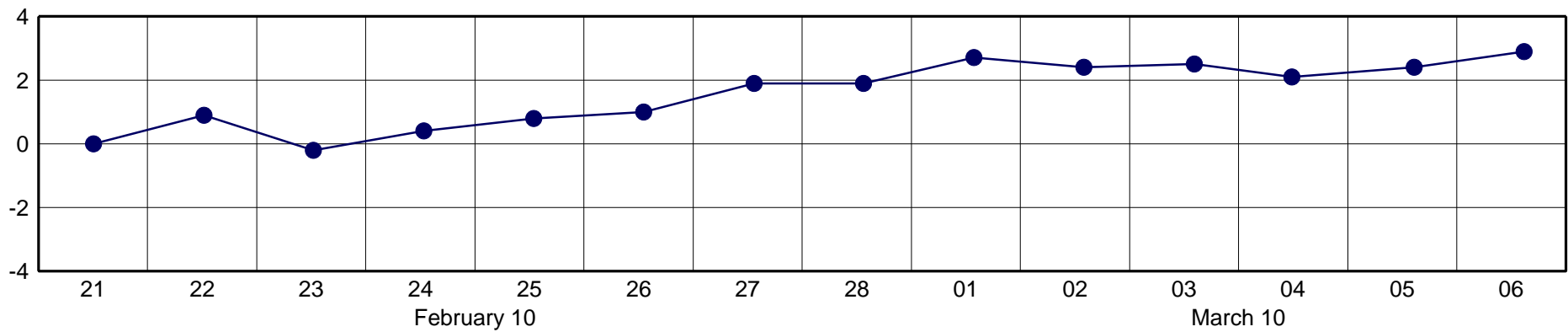
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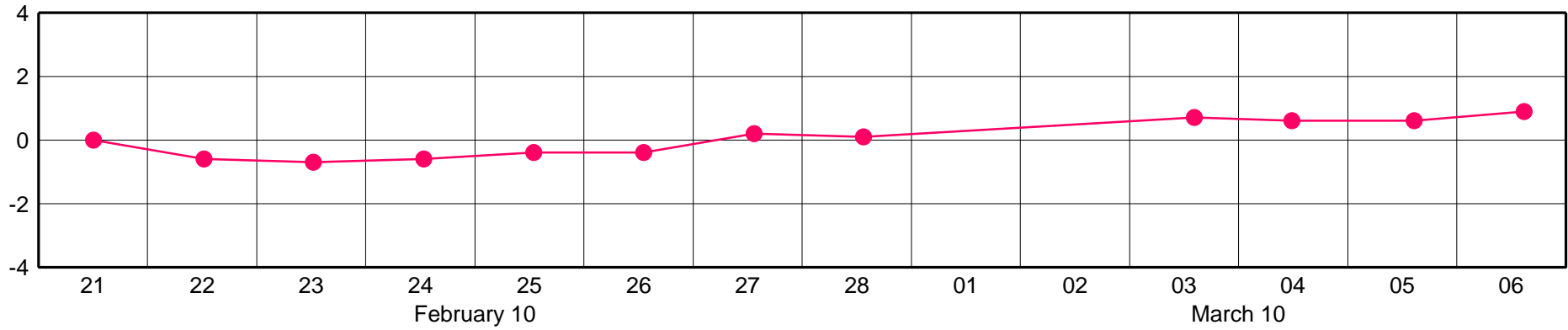


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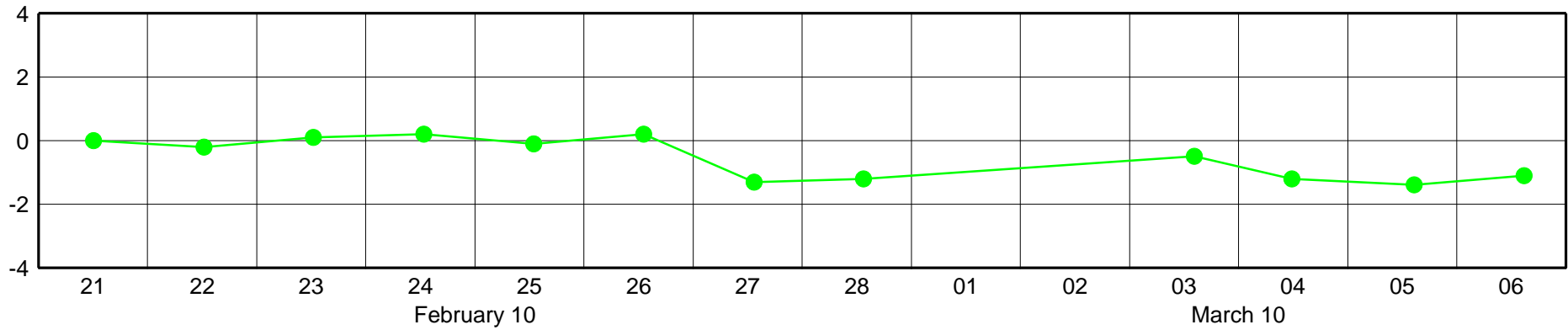


RWSN-North [cm]

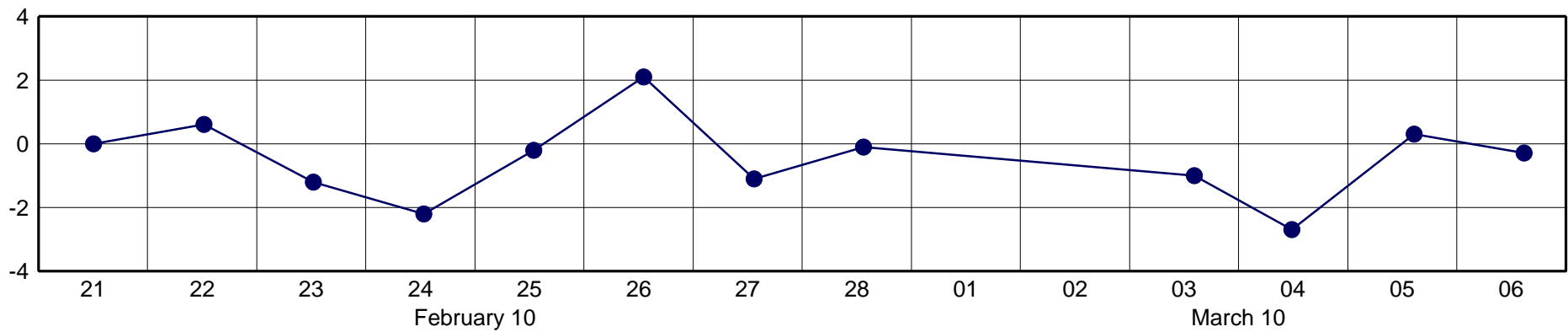
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RWSN-East [cm]

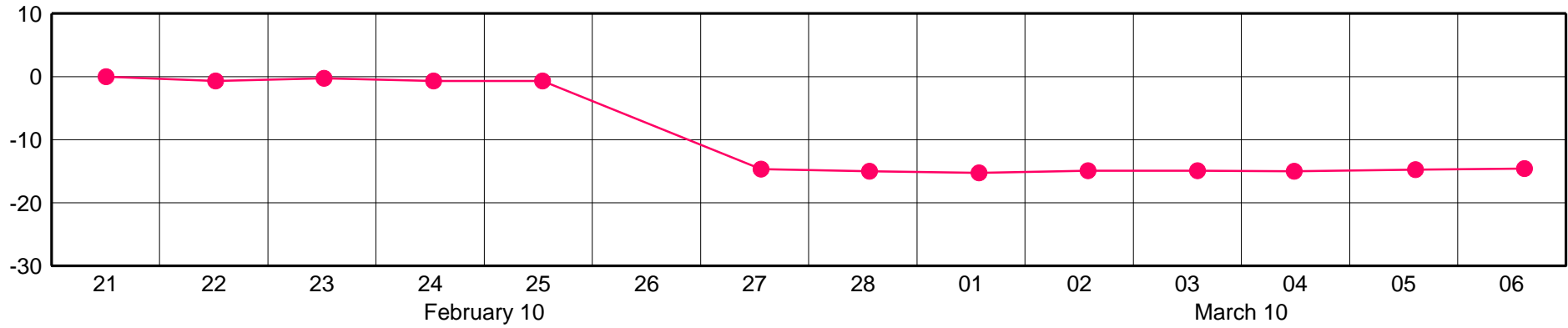


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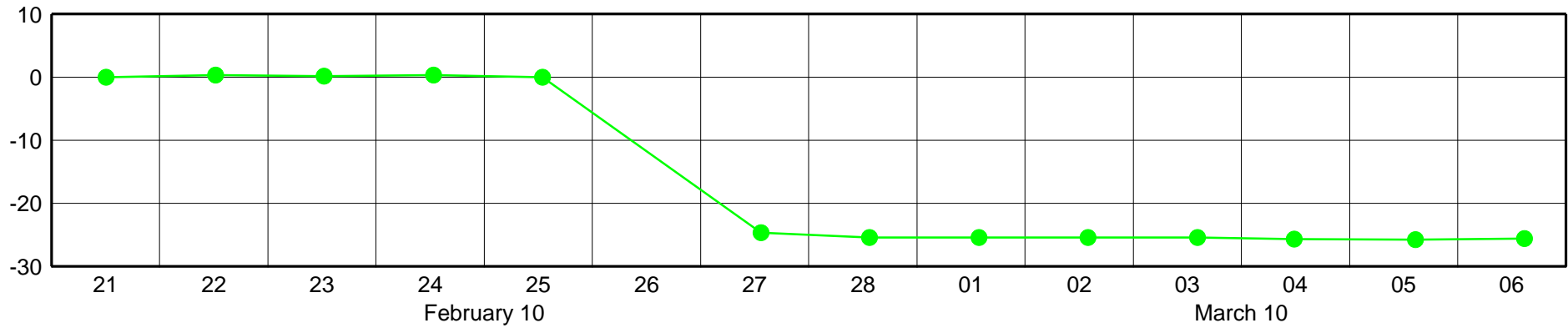


SANT-North [cm]

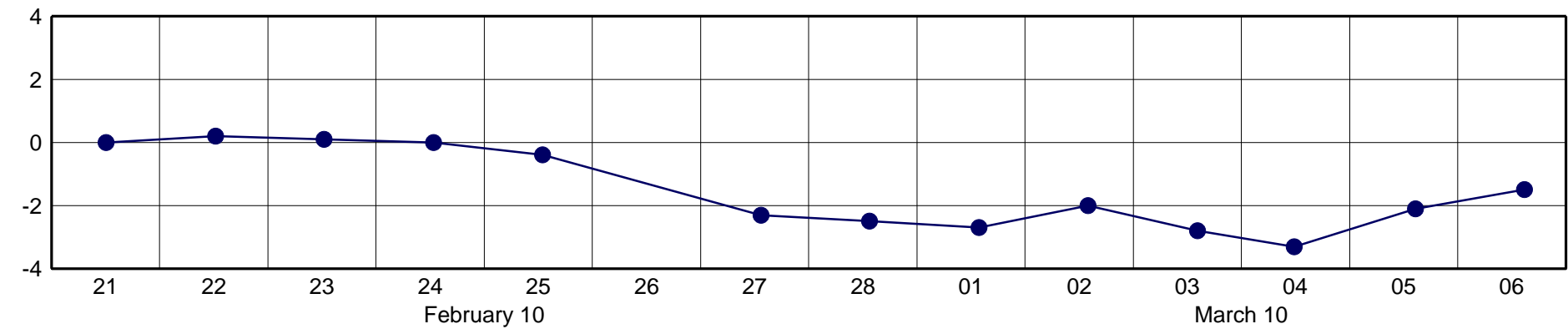
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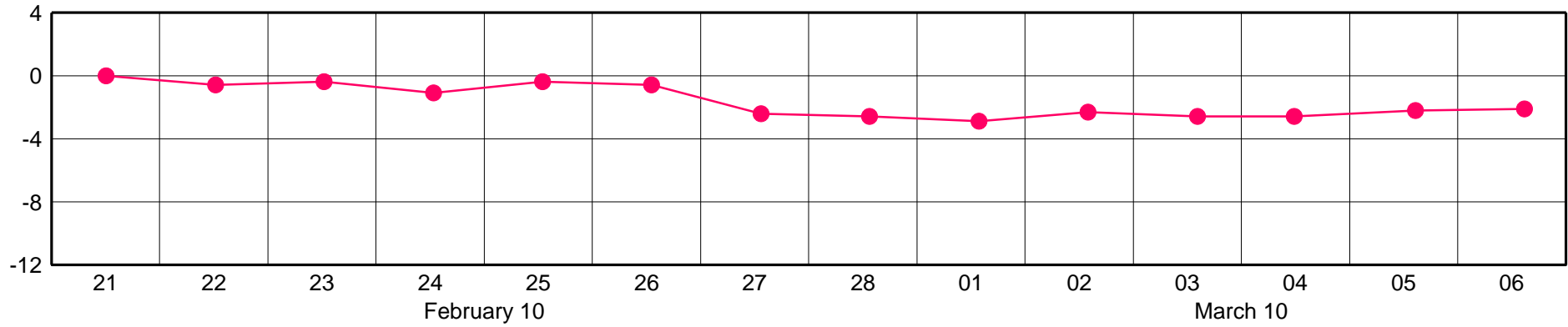


SANT-Up [cm]

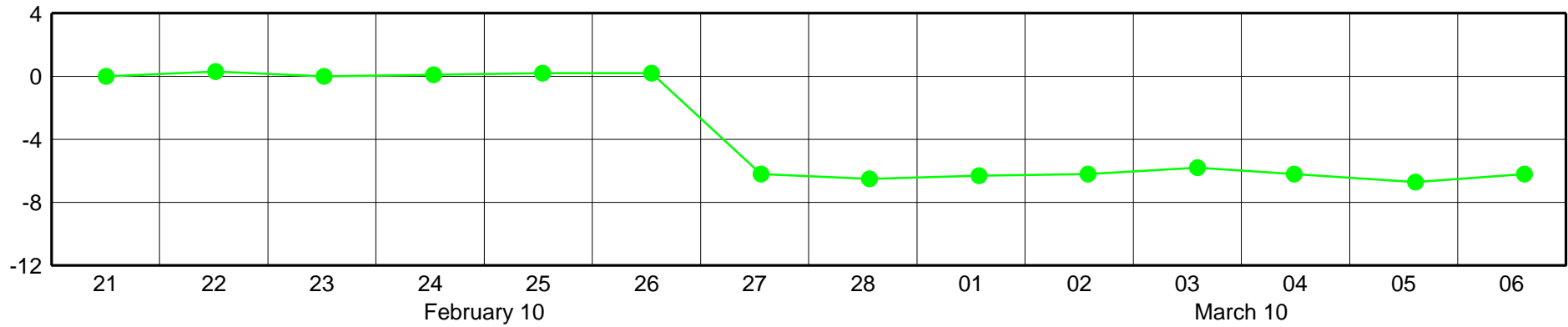


SL01-North [cm]

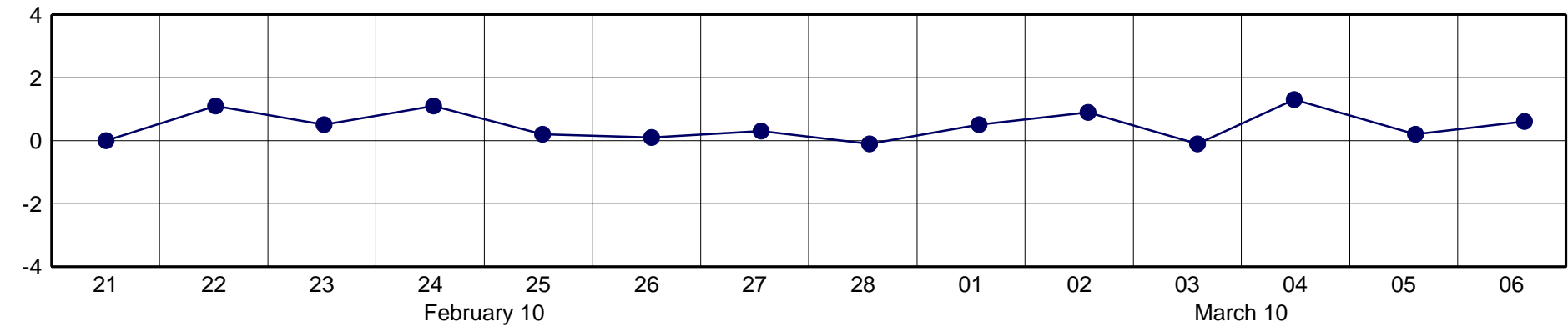
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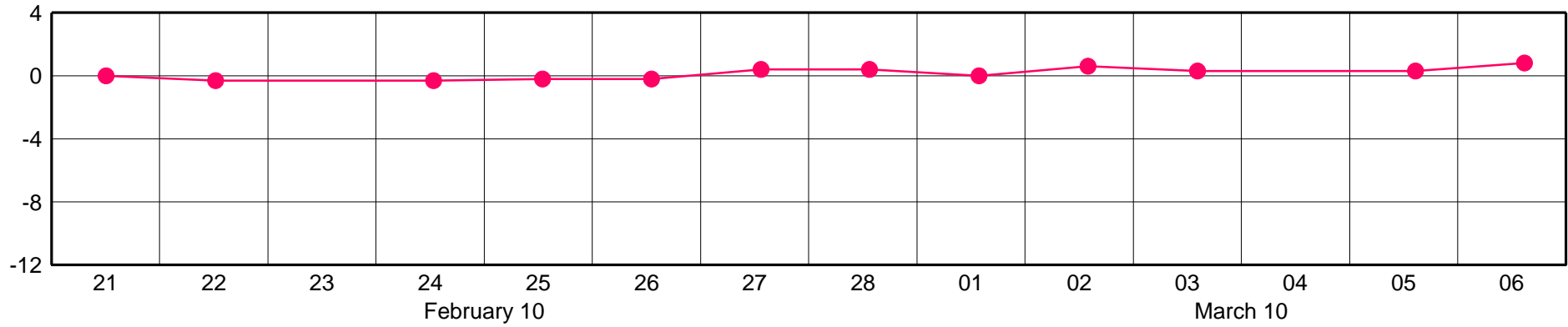


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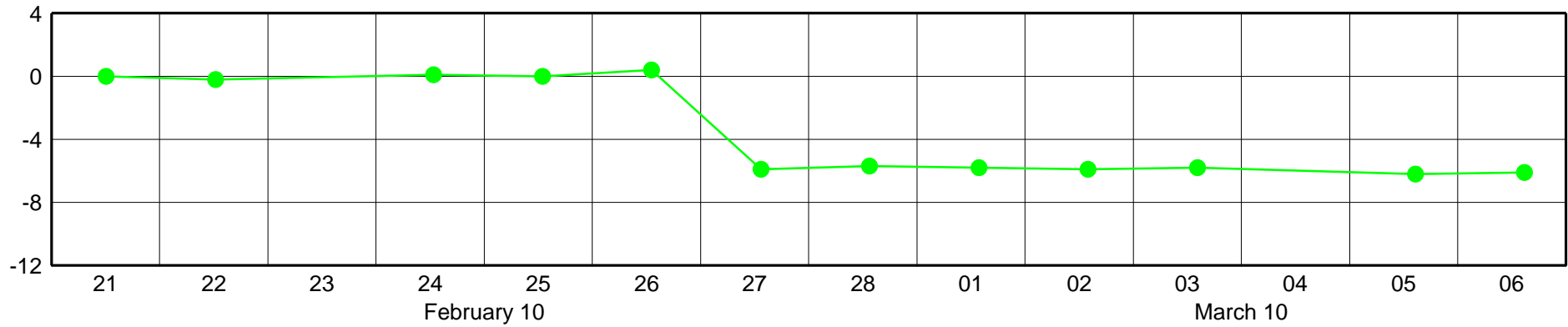


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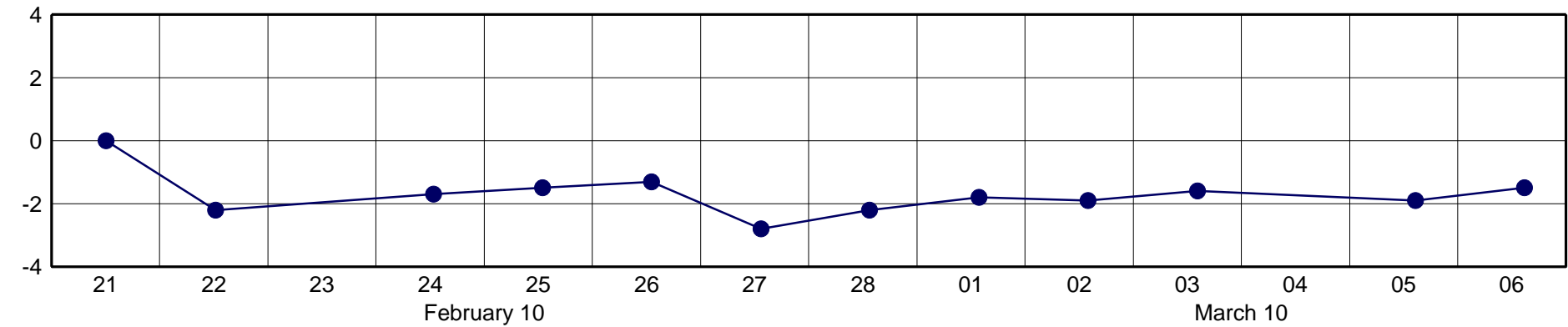
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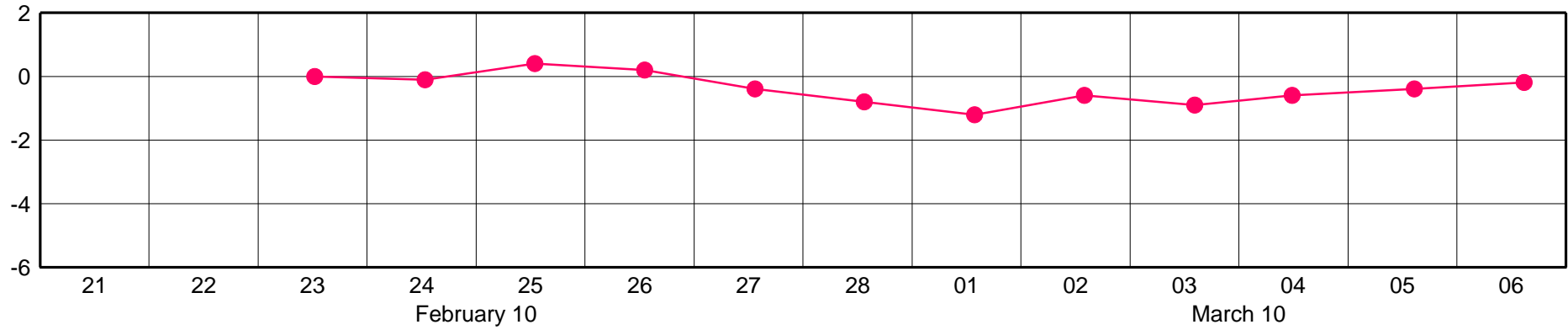


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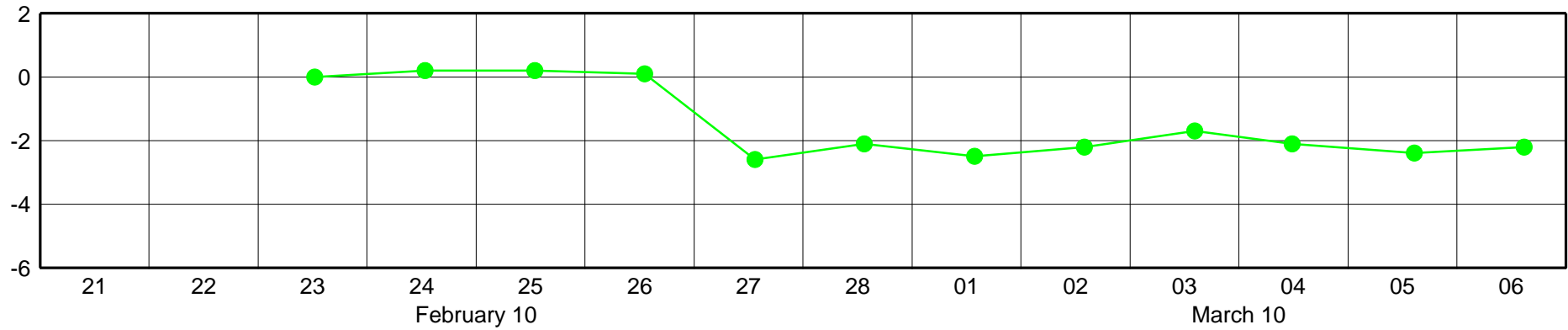


UCOR-North [cm]

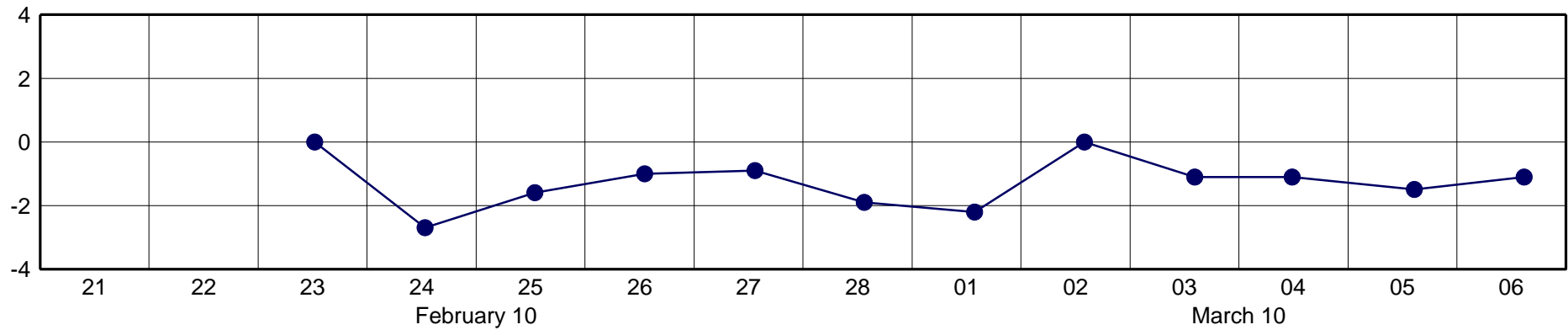
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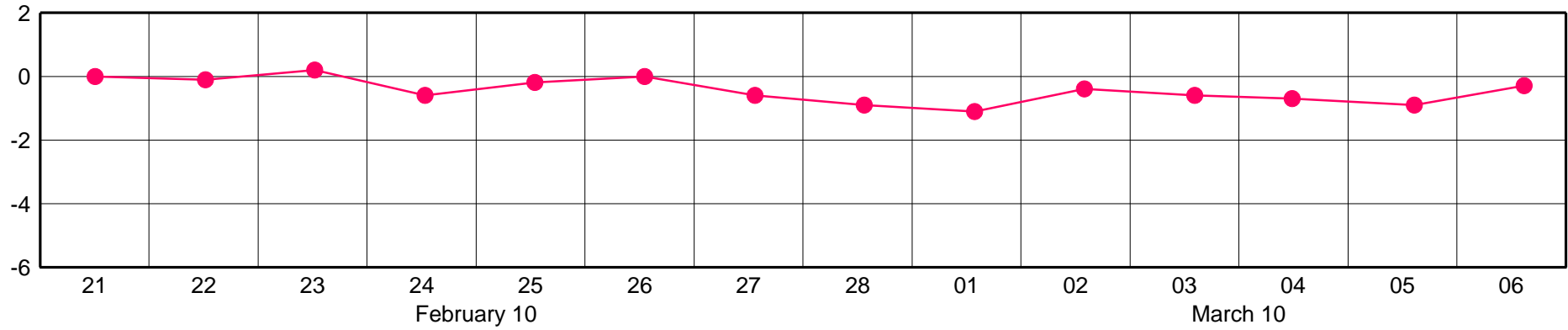


UCOR-Up [cm]

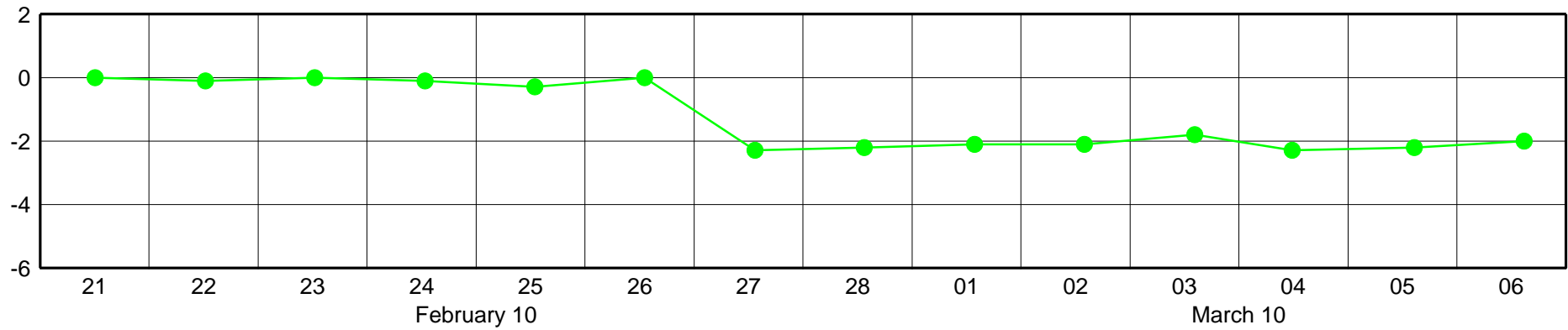


UNRO-North [cm]

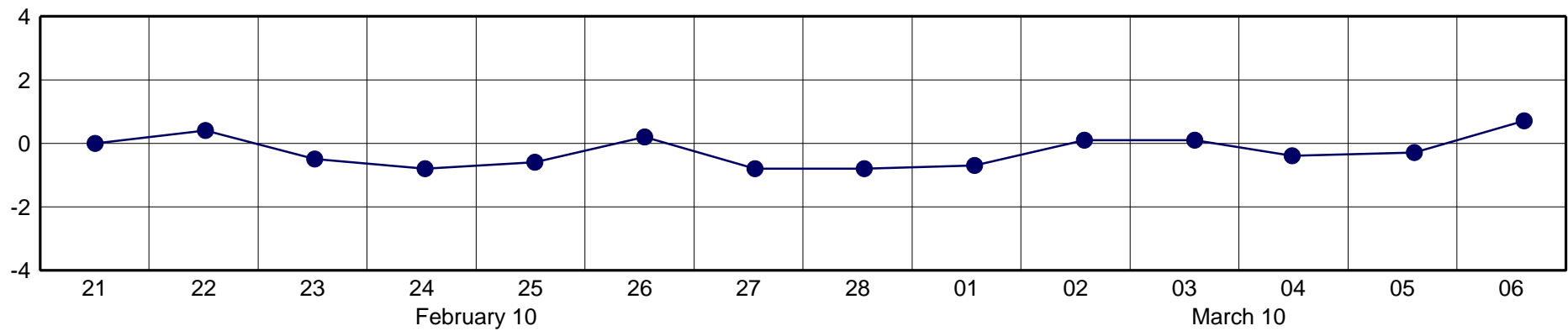
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UNRO-East [cm]

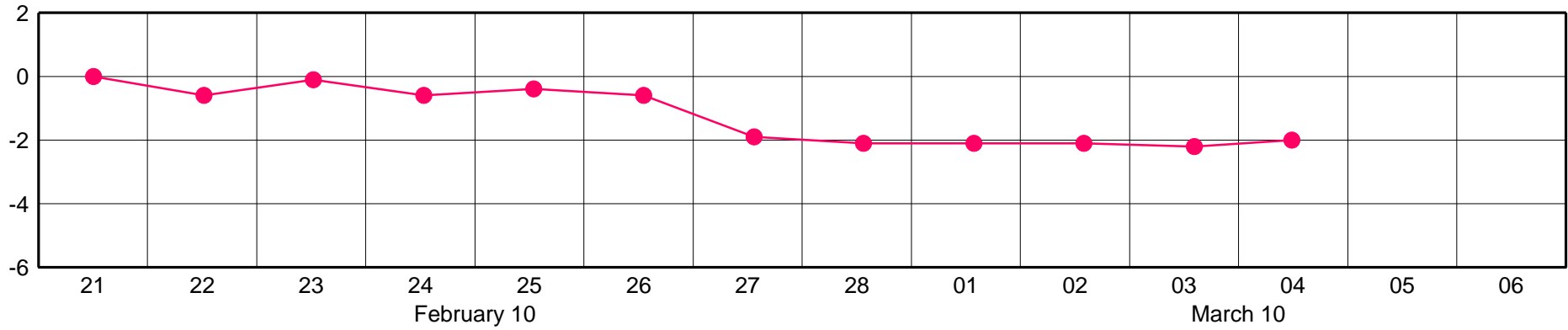


UNRO-Up [cm]

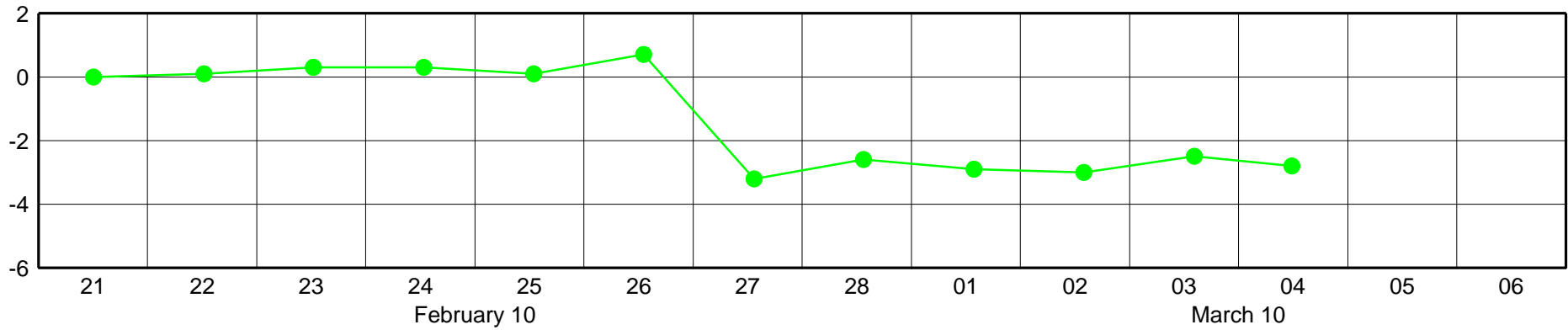


UNSJ-North [cm]

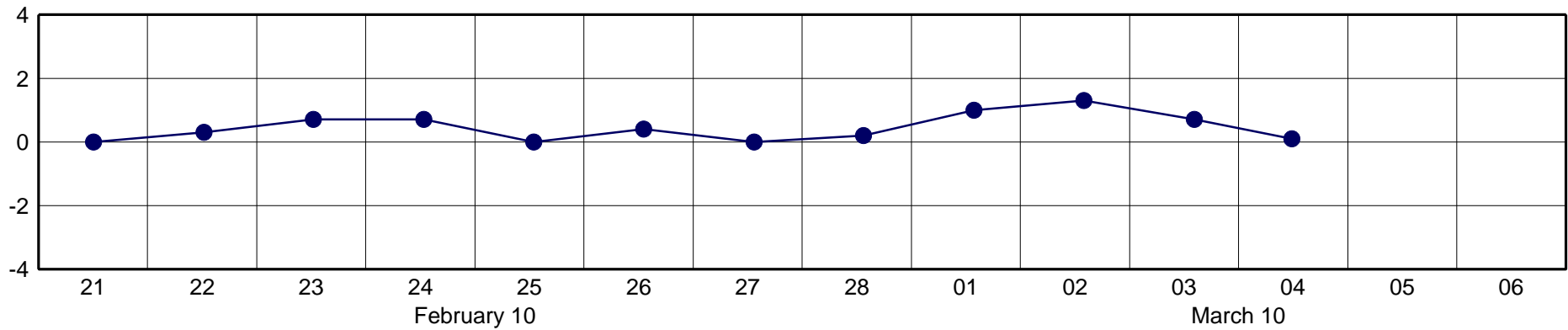
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UNSJ-East [cm]

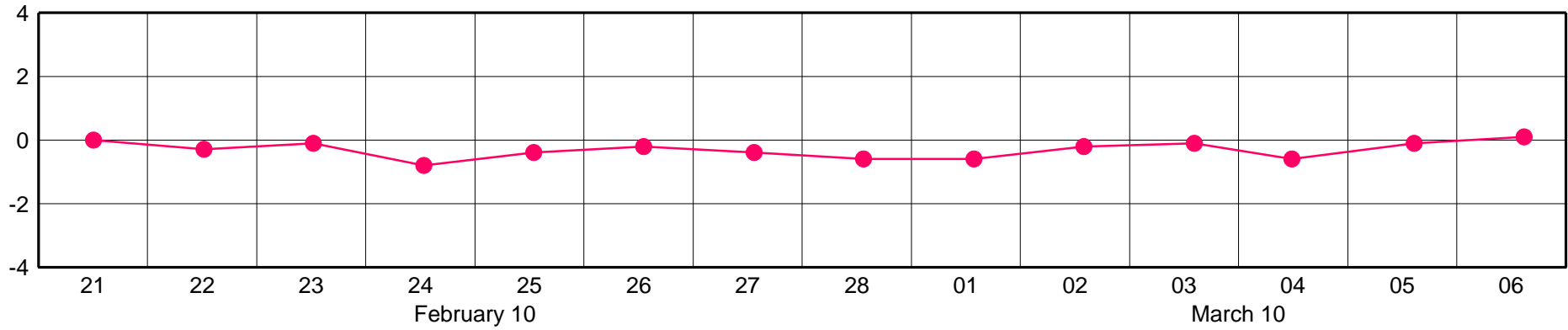


UNSJ-Up [cm]

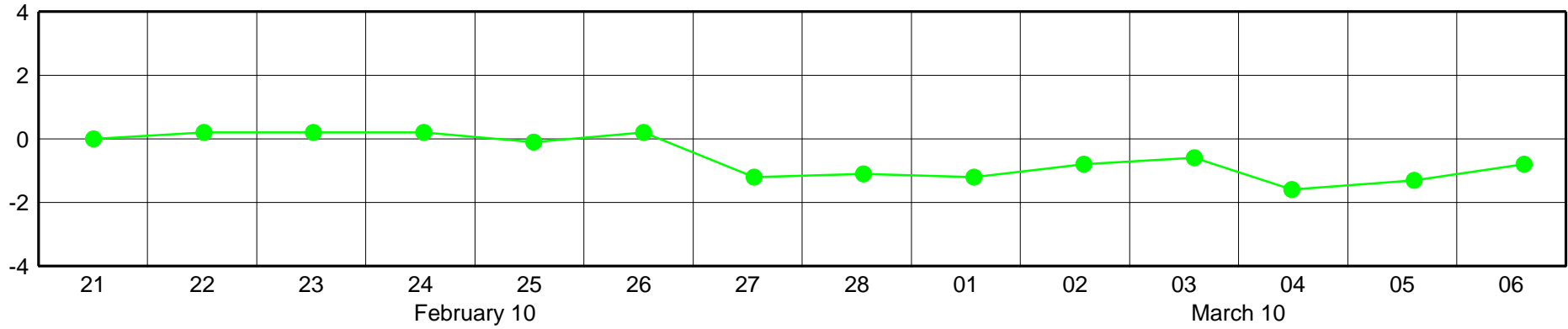


UYMO-North [cm]

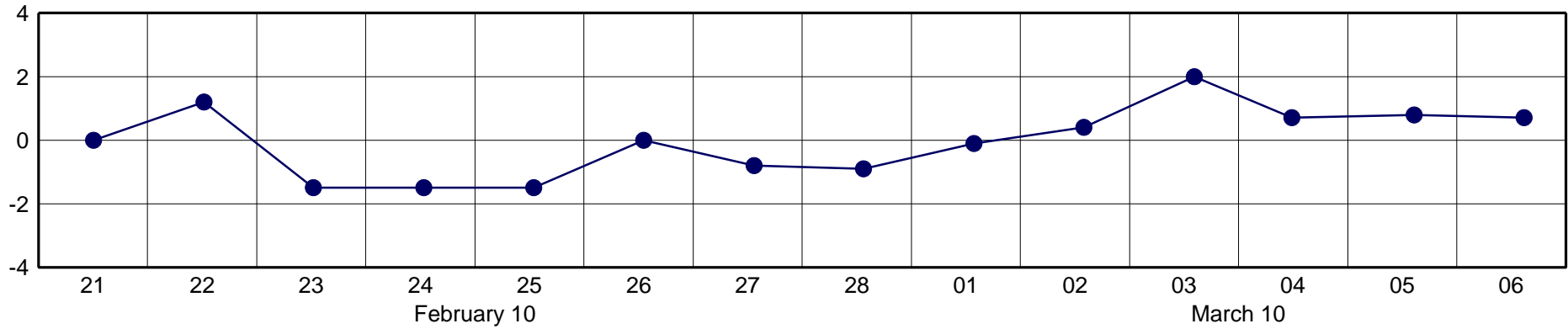
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UYMO-East [cm]

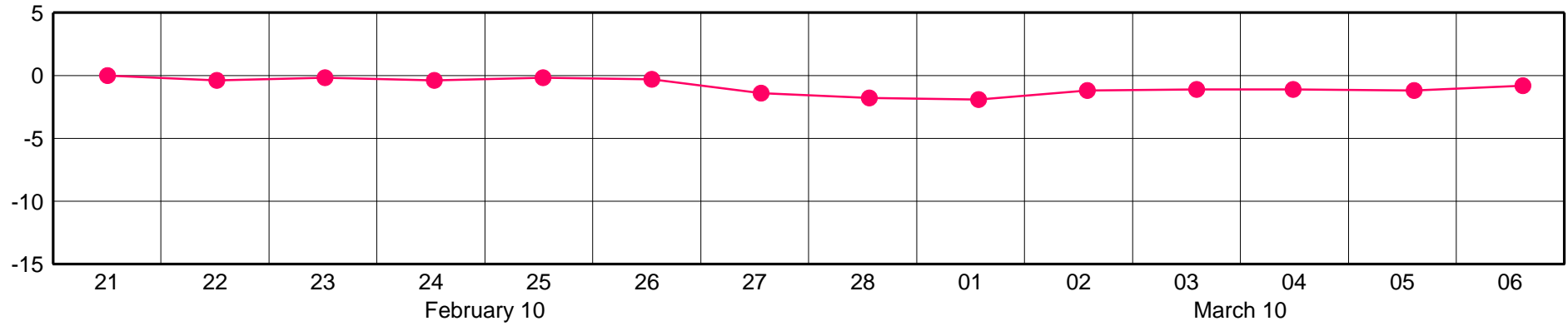


UYMO-Up [cm]

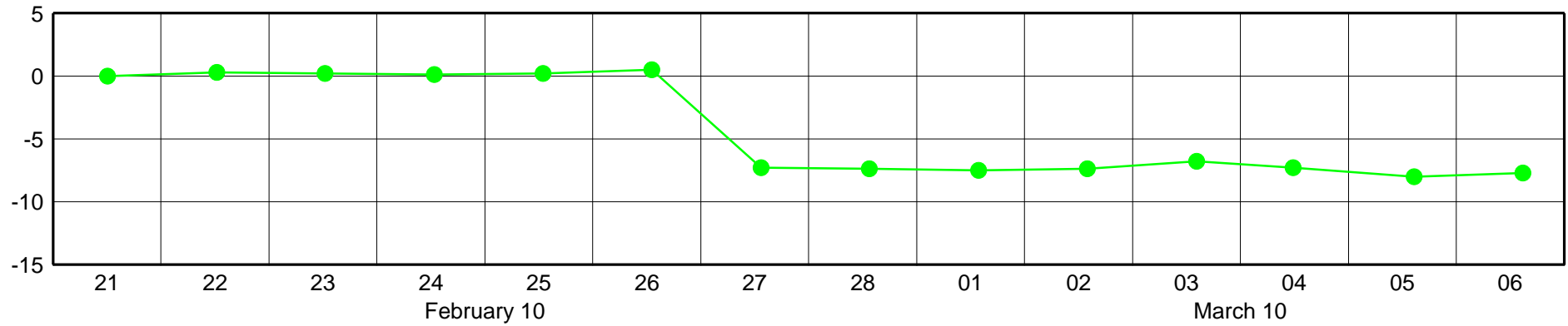


VALP-North [cm]

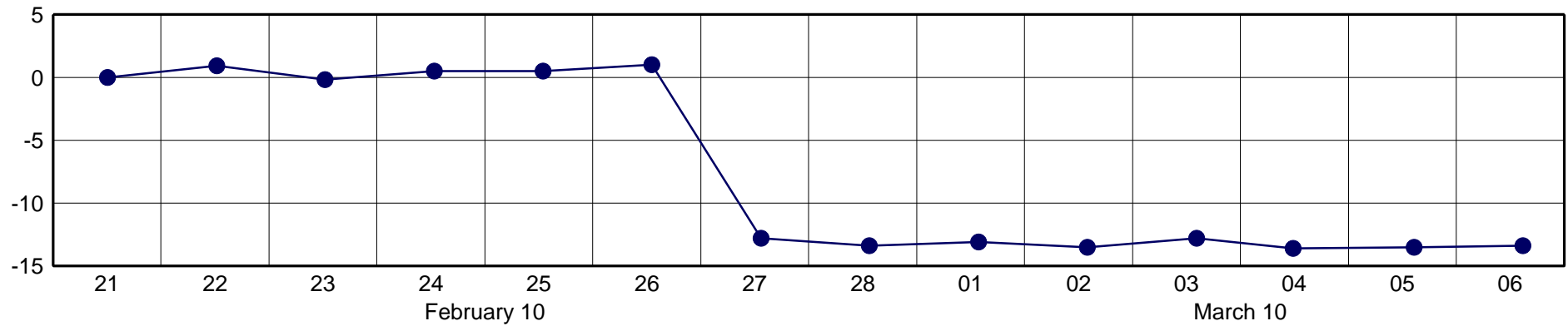
SIRGAS Analysis Centre at DGFI



VALP-East [cm]

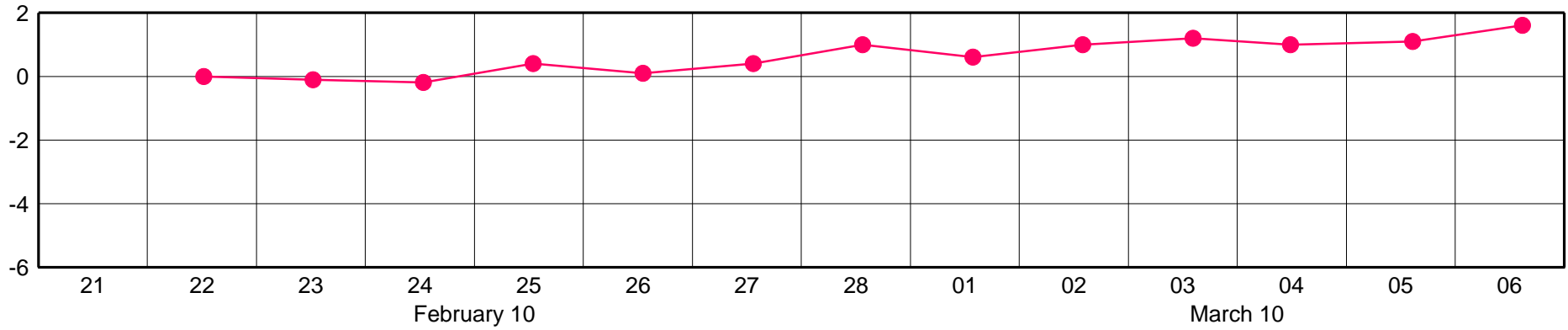


VALP-Up [cm]

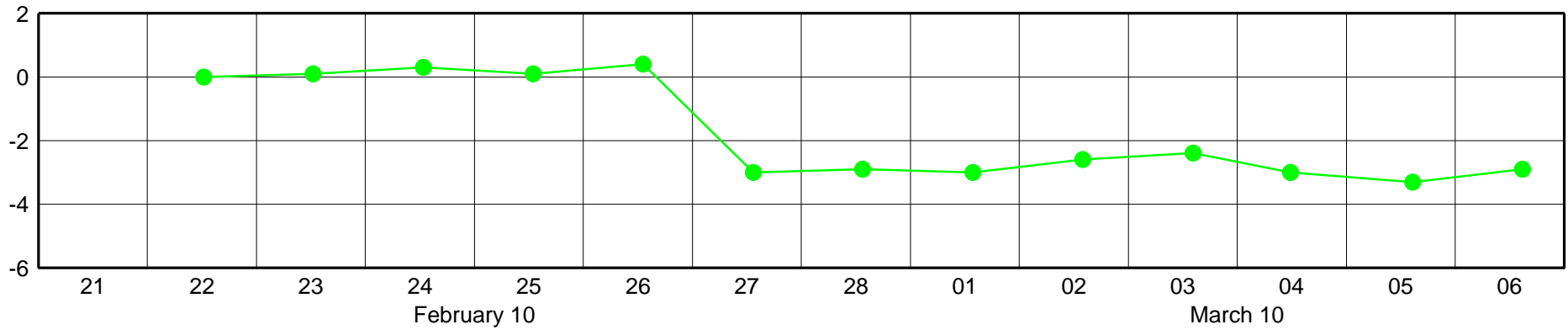


VBCA-North [cm]

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VBCA-East [cm]



VBCA-Up [cm]

