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DE AGRICULTURA Y PESCA,
ALIMENTACION Y MEDIO AMBIENTE



CONFEDERACIÓN
HIDROGRÁFICA
DEL EBRO

INFORME DEL COMPORTAMIENTO DE LA LADERA DERECHA DE LA PRESA DE YESA (NAVARRA). MAYO 2017



Zaragoza, mayo de 2017

Confederación Hidrográfica del Ebro.

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INFORME DEL COMPORTAMIENTO DE LA LADERA DERECHA DE LA PRESA DE YESA (NAVARRA). MAYO 2017.

1. Introducción

Desde el 7 de febrero de 2013 hasta finalizar ese año, se realizaron las obras para la mejora de la ladera del estribo derecho de la Presa de Yesa (Navarra y Zaragoza), que fueron declaradas de emergencia, realizando los siguientes trabajos:

- Excavación de 1.500.000 m³ de la parte superior de la ladera
- Ejecución de Bloques de hormigón en el pie de la ladera entre las cotas 460 y 510 (hormigonado de 22.000 m³).
- Impermeabilización de la ladera mediante la ejecución de siete bermas, contenciones locales, cunetas triangulares y bajantes prefabricadas de drenaje de la ladera.
- Ejecución de 10 anclajes de cables de sostenimiento de 120 tn.
- Auscultación de la ladera a base de piezómetros de cuerda vibrante, inclinómetros e hitos topográficos.
- Medidas correctoras de impacto ambiental: capa vegetal, hidrosiembras, etc.

El último informe presentado concluía que la ladera no tenía movimiento significativo, y que los puntos que se movían, lo hacían con Movimiento Extremadamente Lento, atendiendo a la Clasificación internacional de Movimiento de Laderas de Cruden y Varnes (1996).

Desde entonces no han ocurrido acontecimientos extraordinarios, no obstante se presenta este informe de interpretación del comportamiento de la ladera.



2. Construcción de la presa recrecida y Mantenimiento de la ladera.

Hasta la actualidad se han colocado 2.700.000 m³ del cuerpo de la nueva presa recrecida, alcanzando una altura sobre cimientos de 81 m y superando en 3 m la cota de coronación de la presa vieja.

Cualquier construcción realizada por el hombre requiere unos trabajos de mantenimiento y las obras de mejora de la ladera no son una excepción.

Hasta que se consolide la ladera y su vegetación, los procesos de erosión hídrica van a favorecer la formación de cárcavas, colmatación discontinua de cunetas, movimientos puntuales de las mismas, aparición de grietas en pequeñas desestabilizaciones locales, etc.



3. Comportamiento global de la ladera.

El análisis del comportamiento global de la ladera se basa en los datos de auscultación suministrados por los puntos de control topográfico y los tubos inclinométricos instalados en la ladera.

a) Puntos de control topográfico

Para el control del movimiento de la ladera se han instalado 79 puntos de control topográfico repartidos por la ladera. Durante las obras de estabilización, varios de estos puntos han sido excavados teniendo que ser sustituidos, por lo que no todos los 79 puntos han coexistido en el tiempo.

La lectura de cada punto de control se ha realizado con una Estación Total de Alta Precisión TM-30 con método de análisis basado en mediciones de desplazamiento de fase (coaxial, láser rojo visible). La precisión en distancia que ofrece este aparato es de 0,6 mm + 1 ppm a prisma y 2 mm + 2 ppm a superficies naturales. La precisión angular es de 0,5" (0.15 mgon).

Se han realizado lecturas semanales compatibilizándolas con las condiciones meteorológicas favorables.

La observación de los puntos de control se realiza mediante el método de medición de series con reconocimiento automático de prismas (ATR). Para cada punto de control en cada campaña se realizan ocho lecturas de las que se obtiene la media aritmética.

En algunas ocasiones las condiciones atmosféricas (refracción, humedad, temperatura) pueden provocar la dispersión de los resultados, afectando a la precisión de la coordenada del punto. En estos casos se ha repetido la observación con una nueva serie, cuando las condiciones atmosféricas han sido más favorables.

La precisión del movimiento de cada punto de control viene determinada por la distancia y el ángulo desde el punto de observación (pilar de observación topográfica con centrado forzoso). De esta forma aquellos puntos situados a mayor altura de la ladera o en los límites del deslizamiento tendrán un mayor error, que vendrá definida por una elipse.

Los puntos de control son pilares de hormigón con centrado forzoso para colocación de prisma topográfico, siendo este método el más preciso en la actualidad, eliminando posibles errores de estacionamiento.

El lector de este informe debe considerar la dificultad de interpretar tasas de movimiento tan pequeñas, muchas veces coincidentes con la apreciación de la instrumentación empleada. Es por ello, que para poder aseverar que existe movimiento de un punto se han impuesto tres criterios de aceptación:

- Criterio de Precisión. El punto debe tener un movimiento superior a 2,5 mm en el período de estudio.
- Criterio de Movimiento Absoluto. El movimiento debe ser significativo en su lectura histórica.
- Criterio Cinemático. El movimiento debe ser gravitacional y compatible con el plano de rotura.

Adjunto a este informe se facilita en formato Excel todas las lecturas topográficas históricas desde enero de 2013, que no se reproducen en papel por ser listados de gran volumen de información.

b) Tubos Inclínométricos

La precisión de un sensor inclinométrico depende de la profundidad del tubo instalado, del tipo de tubo, de su colocación, de la resolución del propio sensor y de las operaciones de lectura. Las casas comerciales ofrecen en catálogo precisiones de ± 2 mm cada 25 m de tubo inclinométrico y la Guía de Cimentaciones en obras de Carreteras del Ministerio de Fomento (2004), describe que la precisión de estos equipos puede estar en el entorno del 1/10.000 de la longitud, o sea de 1 cm para longitudes de 100 m.

Para la interpretación de los datos inclinométricos presentados, se han utilizado dos criterios:

- Criterio de movimiento en cabeza. Para una profundidad de 100 m, una lectura obtenida en cabeza inferior a 10 mm (1/10.000 de la longitud) se puede considerar error de precisión y no indicaría certeza de movimiento de ese punto.



- Criterio de movimiento en el plano de rotura. Se ha considerado como parado aquel inclinómetro con una tasa de movimiento incremental inferior a 1,5 mm/año respecto a la última lectura anualizada, a la altura del plano de rotura.

En el Anejo N° 4 de este Informe se representa el movimiento y la evolución de cada tubo inclinométrico.



4. Conclusiones

A continuación se resume el contenido de este informe.

El estudio presentado es continuación de los emitidos anteriormente, y su periodo de análisis, abarca desde noviembre de 2016 a mayo de 2017.

Durante este periodo ha habido que destacar el registro de un sismo de magnitud 4,4 mbLg en las inmediaciones de Pamplona (a 40 km de distancia de la presa de Yesa) con fecha 10 de marzo de 2017, y una gran variedad de sismos adicionales de menor magnitud, pero que muchos de ellos superaban la magnitud 3. La auscultación realizada tras estos fenómenos indica que **esta sismicidad no ha variado el comportamiento de la ladera**.

En cuanto al comportamiento global de la ladera, a partir de la valoración de los datos de auscultación que se exponen en este informe, se pueden realizar las siguientes conclusiones:

- La ladera de la margen derecha de Yesa **no tiene movimiento significativo**.
- Según la Clasificación internacional de movimiento de laderas de Cruden y Varnes (1996), este movimiento corresponde a su umbral más bajo, denominado como **“movimiento extremadamente lento”**.
- No se han encontrado circunstancias que hayan cambiado las condiciones de estabilidad de la ladera en su conjunto.
- Están establecidos los **mecanismos de auscultación que prevean cualquier cambio significativo de estas condiciones**.

La situación actual de paralización del movimiento global de la ladera, no impide que puedan existir en un futuro movimientos locales puntuales, relacionados con el proceso de vaciado del embalse en la zona de aguas arriba de la presa actual, en la propia ladera como consecuencia de los efectos de la lluvia, o en el pie de aguas abajo como consecuencia del movimiento de tierras necesario para la construcción de la nueva presa.



Estos movimientos locales no afectarían previsiblemente a las condiciones de seguridad de la globalidad de la ladera, tal y como ha sucedido en los casos presentados.

Como última fase para reforzar la estabilidad de la ladera se deberán ejecutar las medidas de sostenimiento previstas, y que consisten en muros y anclajes de cables, galerías de drenaje y una pantalla continua de impermeabilización.

Si cambiara la situación actual de comportamiento de la ladera, se comunicaría esta circunstancia, tal y como se ha realizado en informes precedentes.

Zaragoza a mayo de 2017.

El Jefe del Área de Seguridad de
Infraestructuras y Geotecnología

Fdo.: René Gómez López de Munain

Examinado y conforme:

El Director Técnico

Fdo.: Francisco J. Hijós Bitrián



RELACIÓN DE ANEJOS INCLUIDOS:

ANEJO N°1: Plano de movimiento de los Puntos de Control Topográfico.

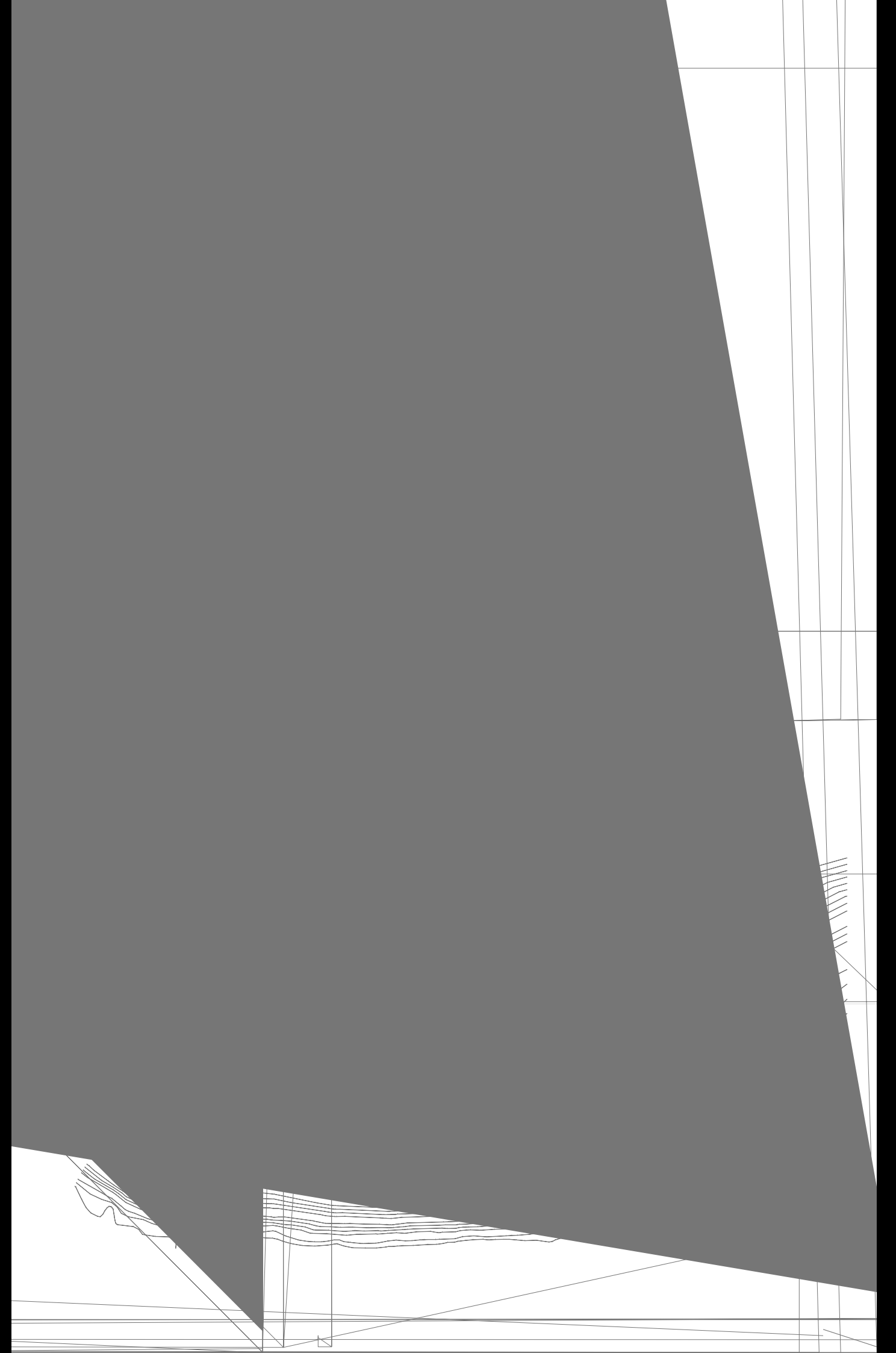
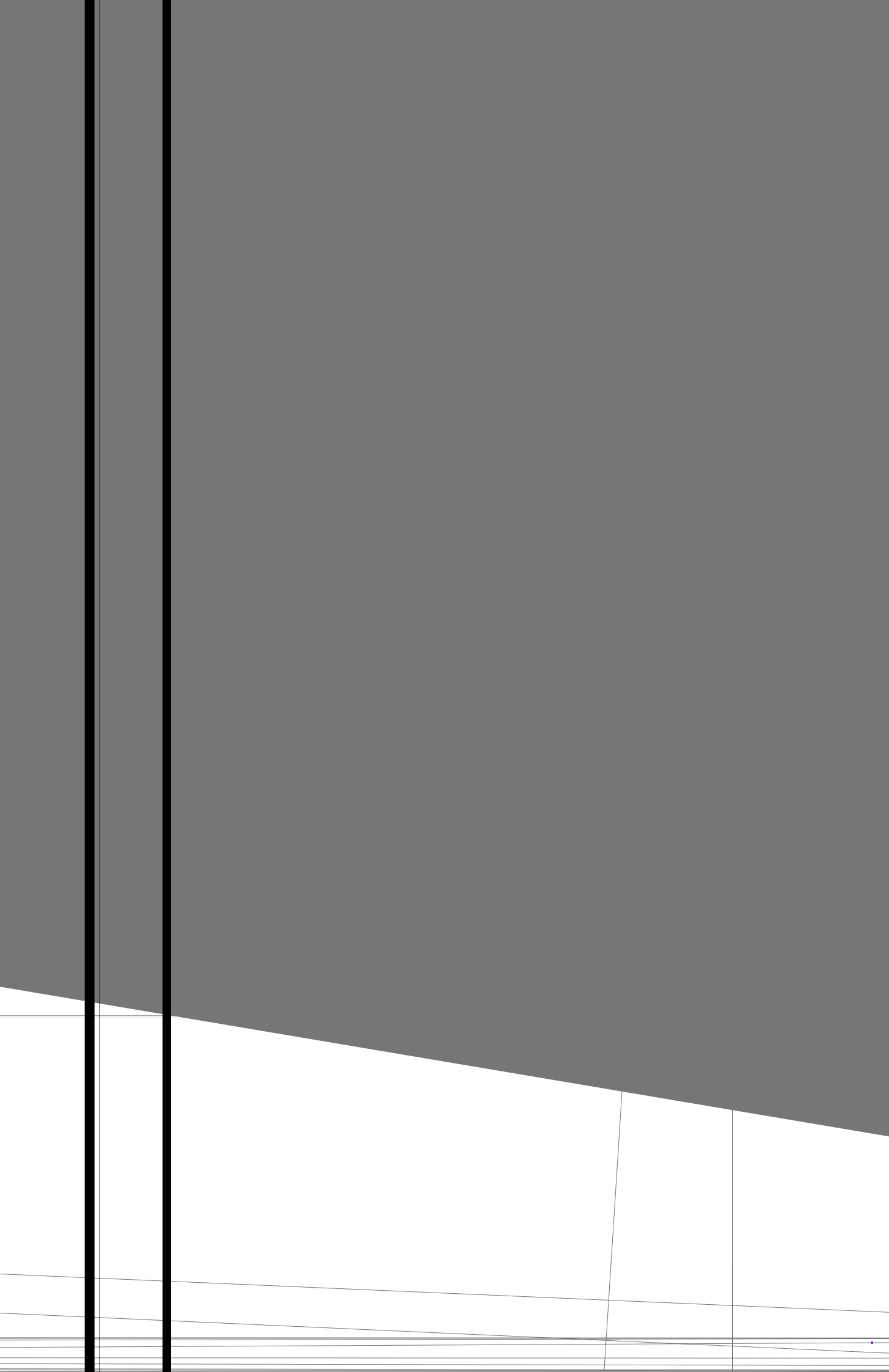
ANEJO N°2: Velocidad de Movimiento de la ladera por Ejes.

ANEJO N° 3: Listado de desplazamiento de los Puntos de Control Topográfico en XY.

ANEJO N°4: Gráficos Inclínométricos



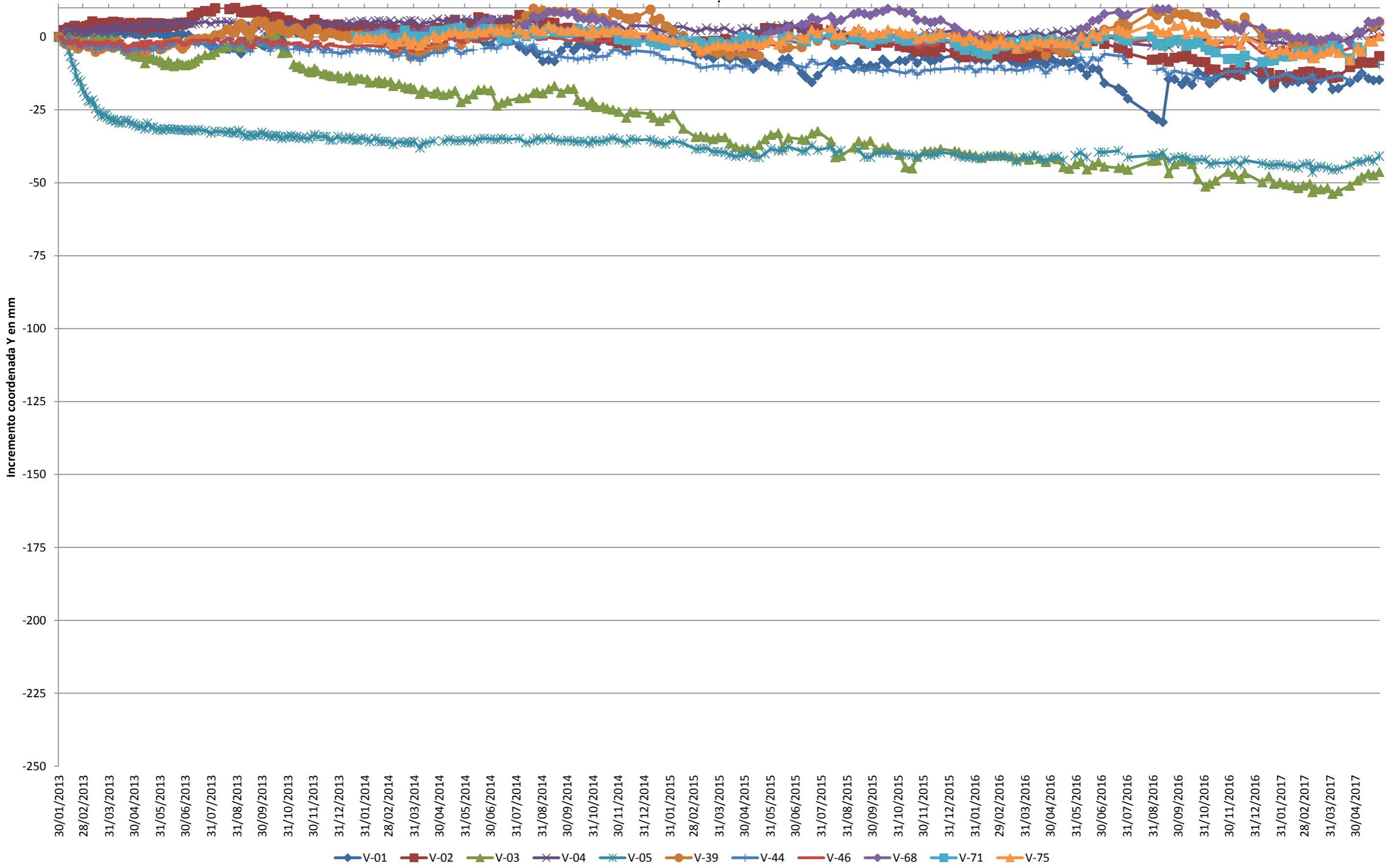
ANEJO N° 1:
Plano de movimiento de los Puntos de Control Topográfico.



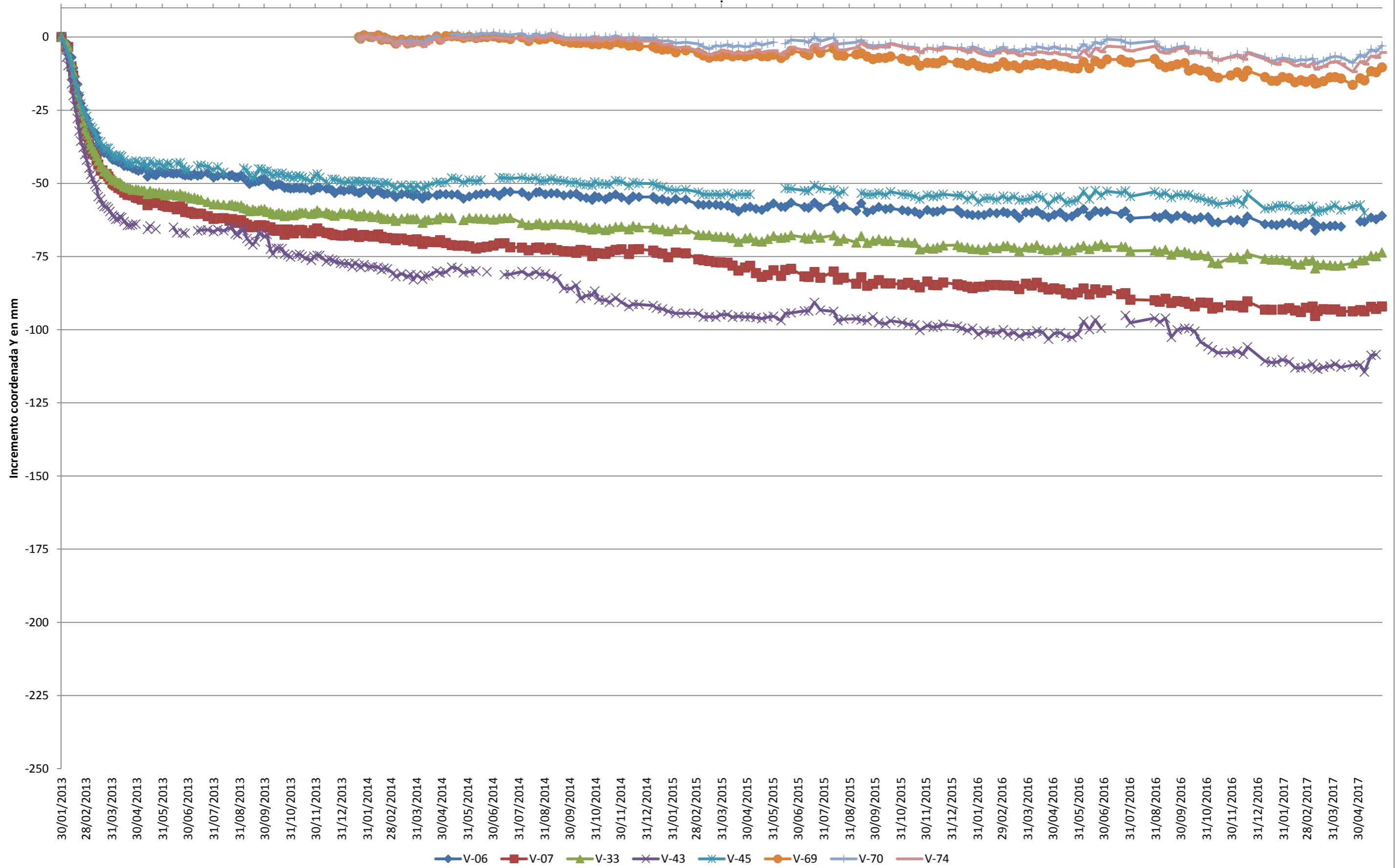


ANEJO N° 2:
Velocidad de Movimiento de la ladera por Ejes

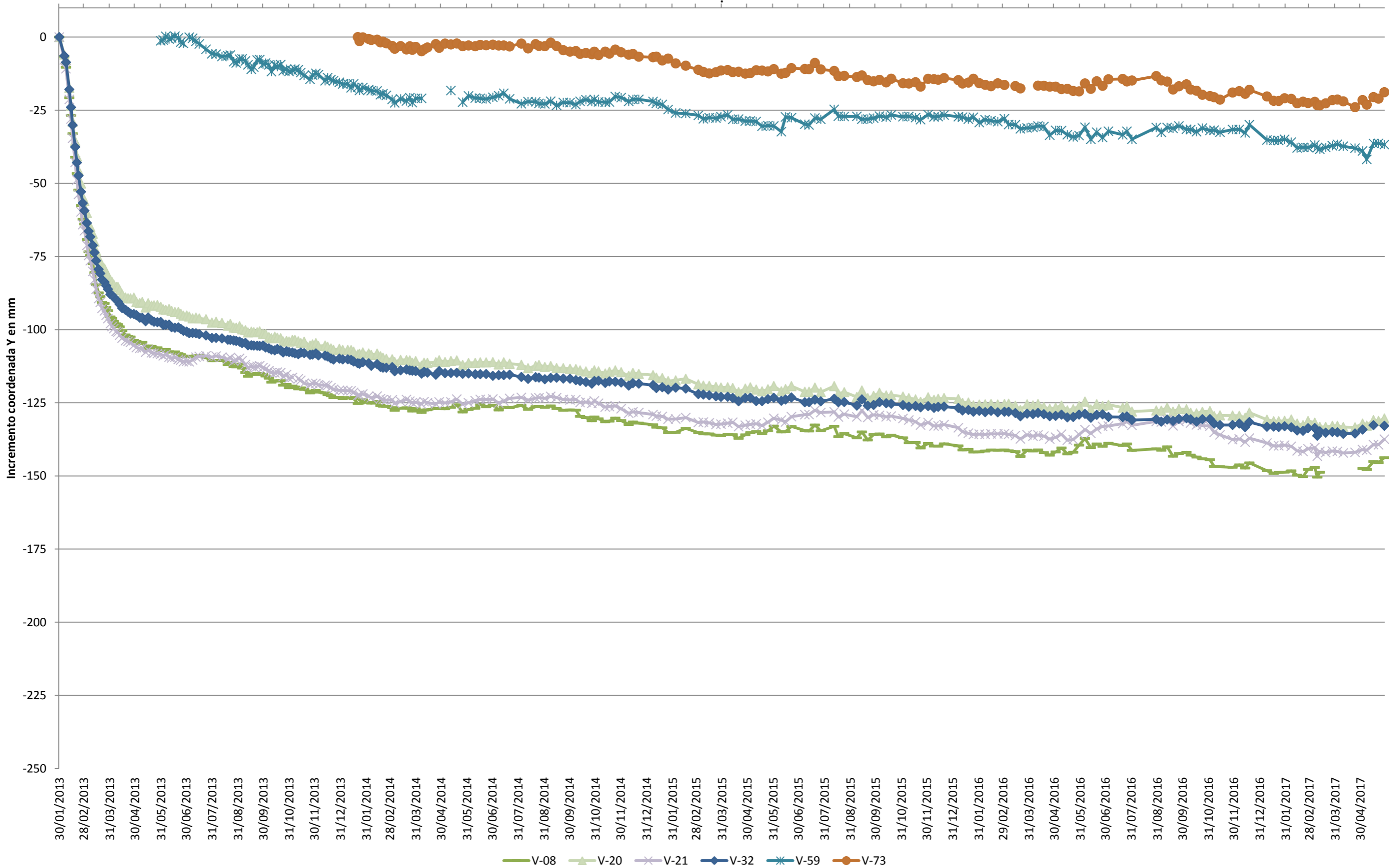
Puntos Exteriores Oeste



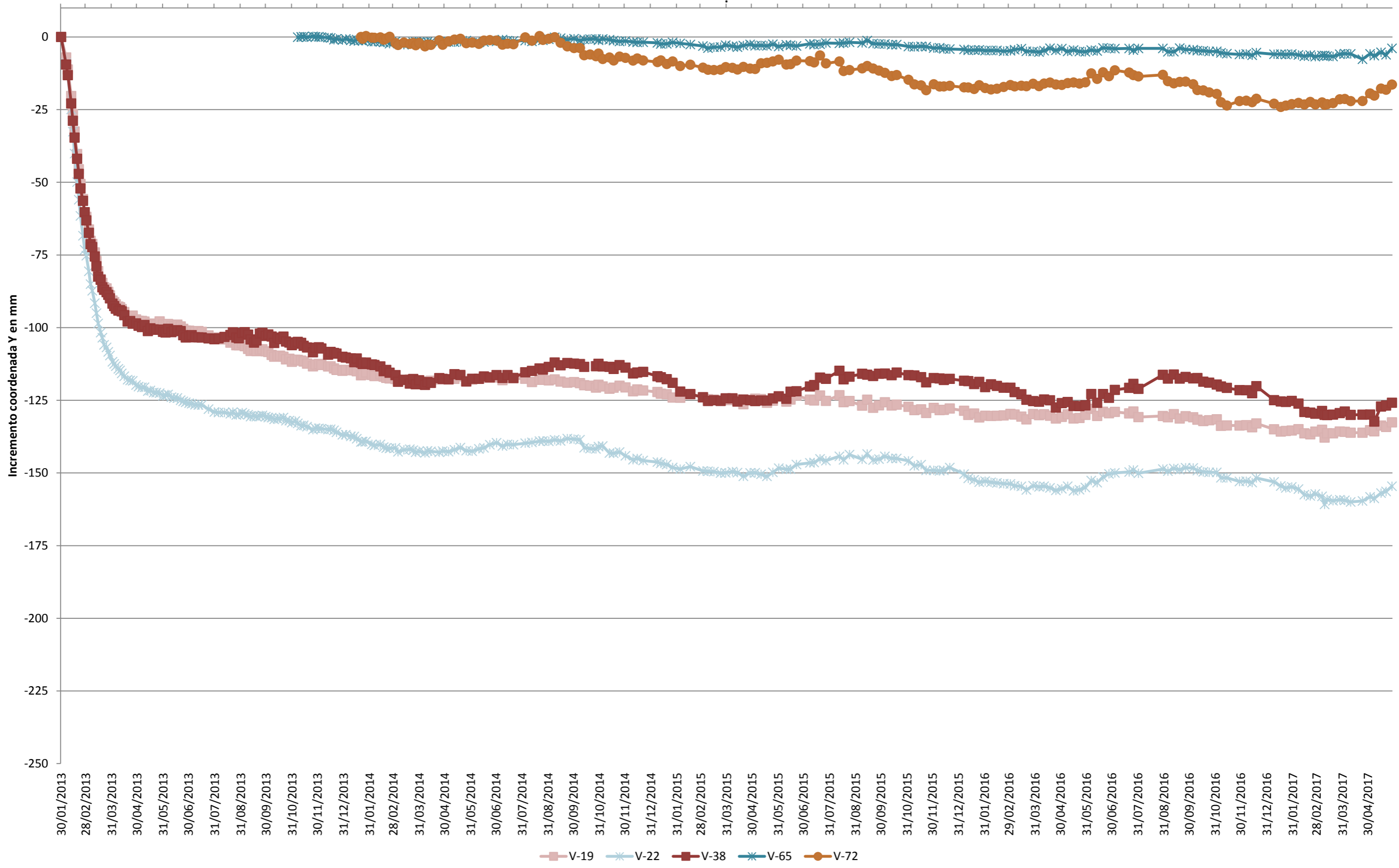
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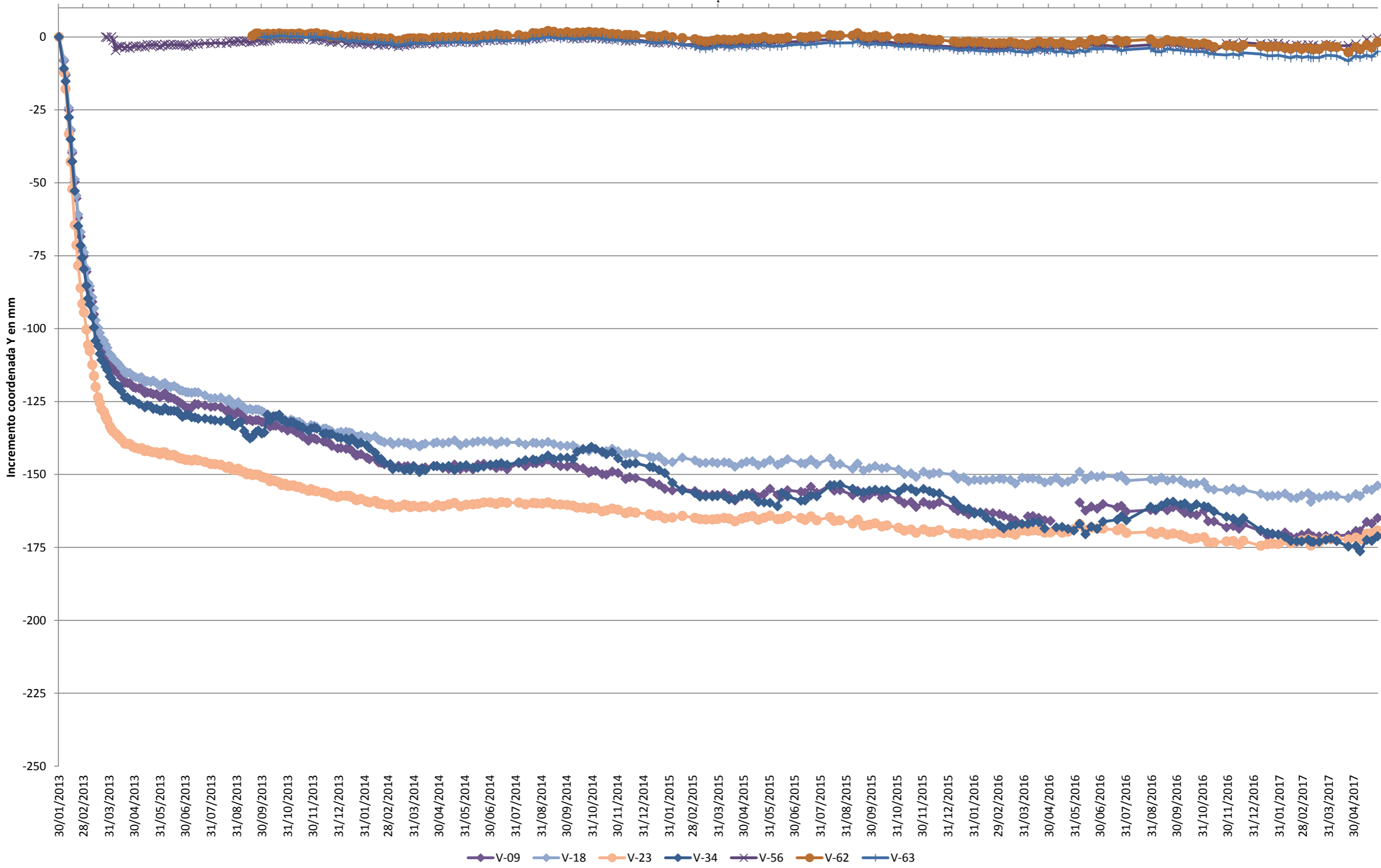
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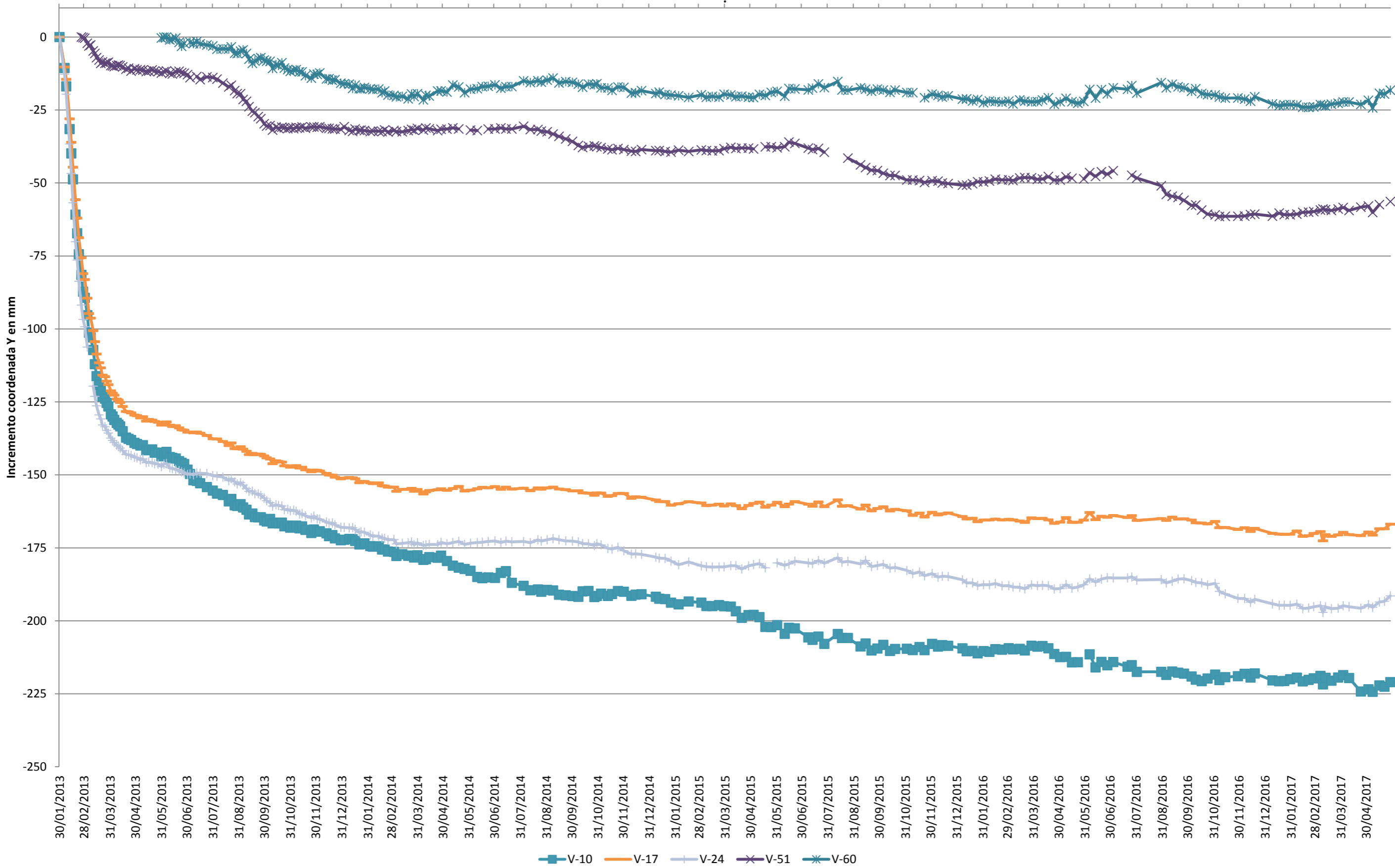
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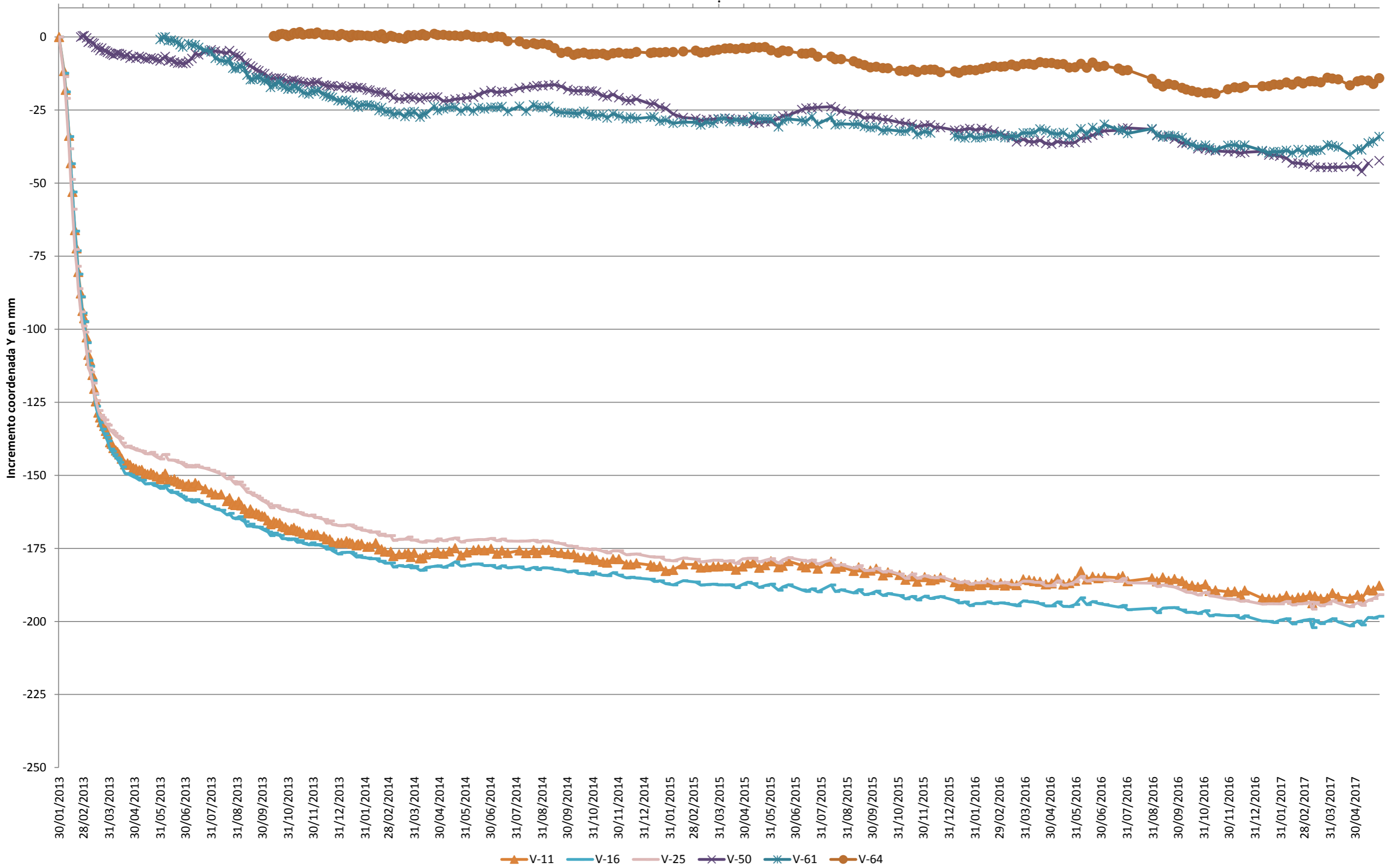
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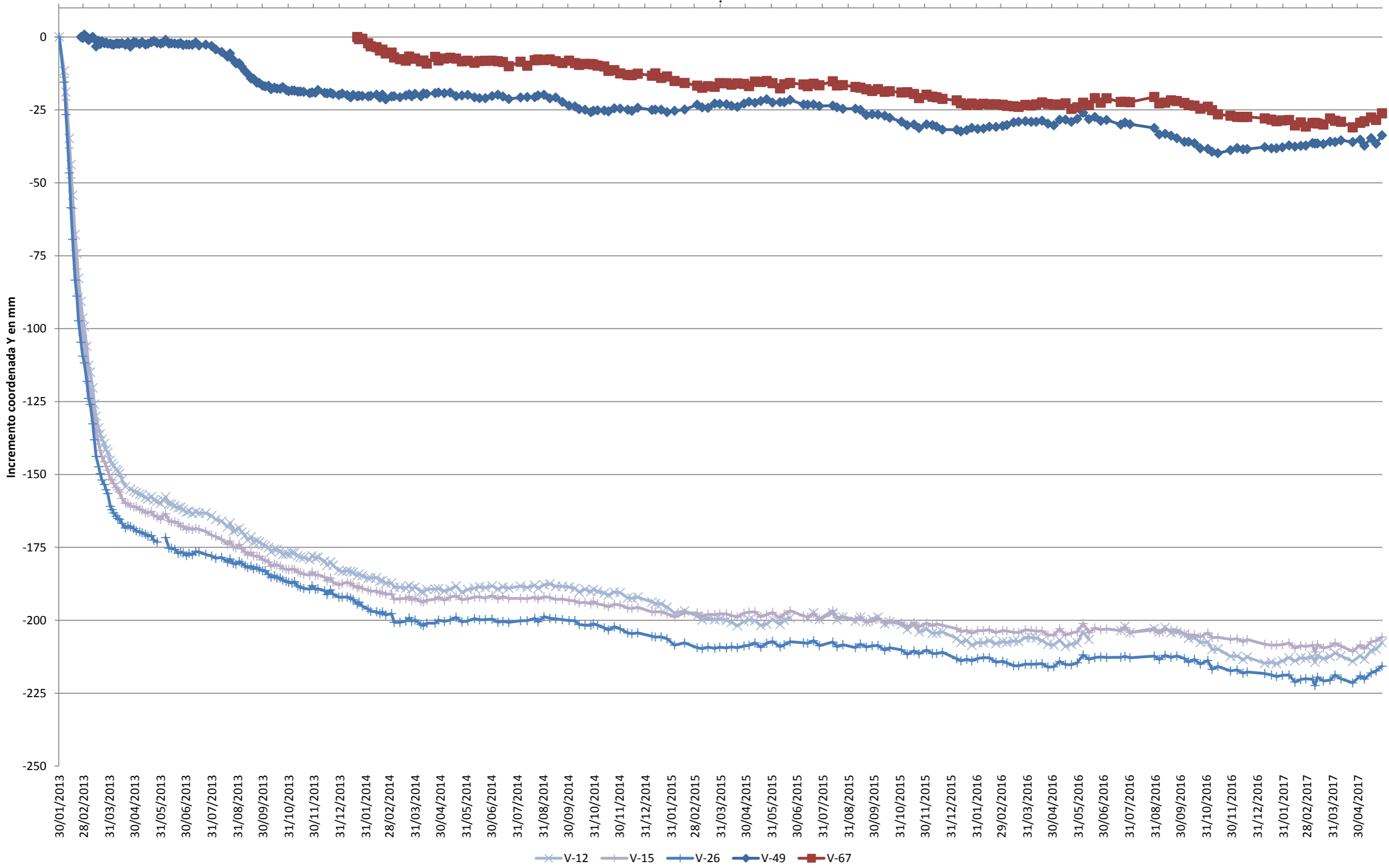
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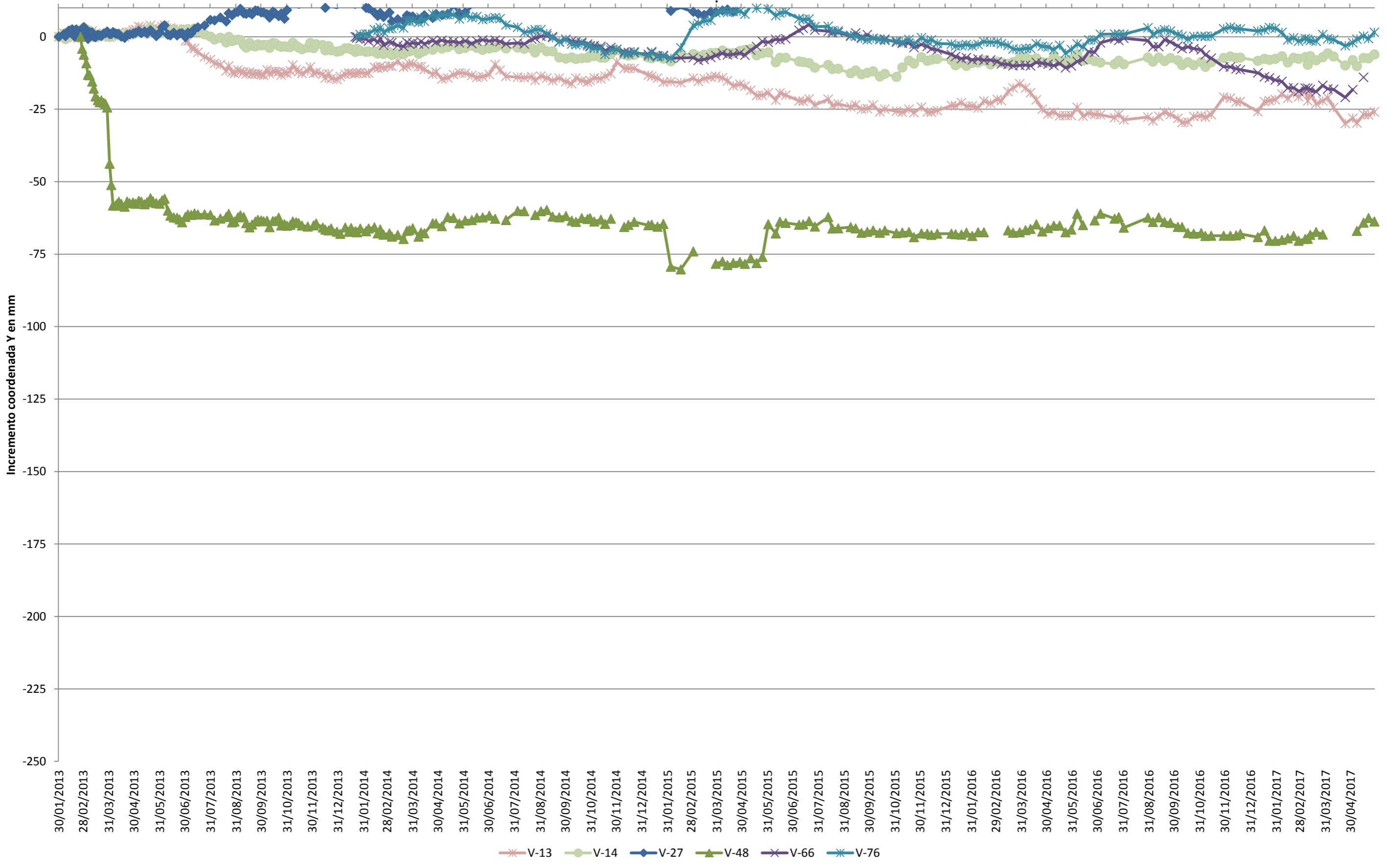
Puntos Eje 5



Puntos Eje 6



Puntos Exteriores Este





ANEJO N°3

Listado de desplazamiento de los Puntos de Control Topográfico en XY.



Se presenta en formato digital una hoja Excel que incluye los datos de movimiento en sus componentes X e Y de todos los puntos de observación topográfica de la ladera desde enero de 2013 hasta la actualidad

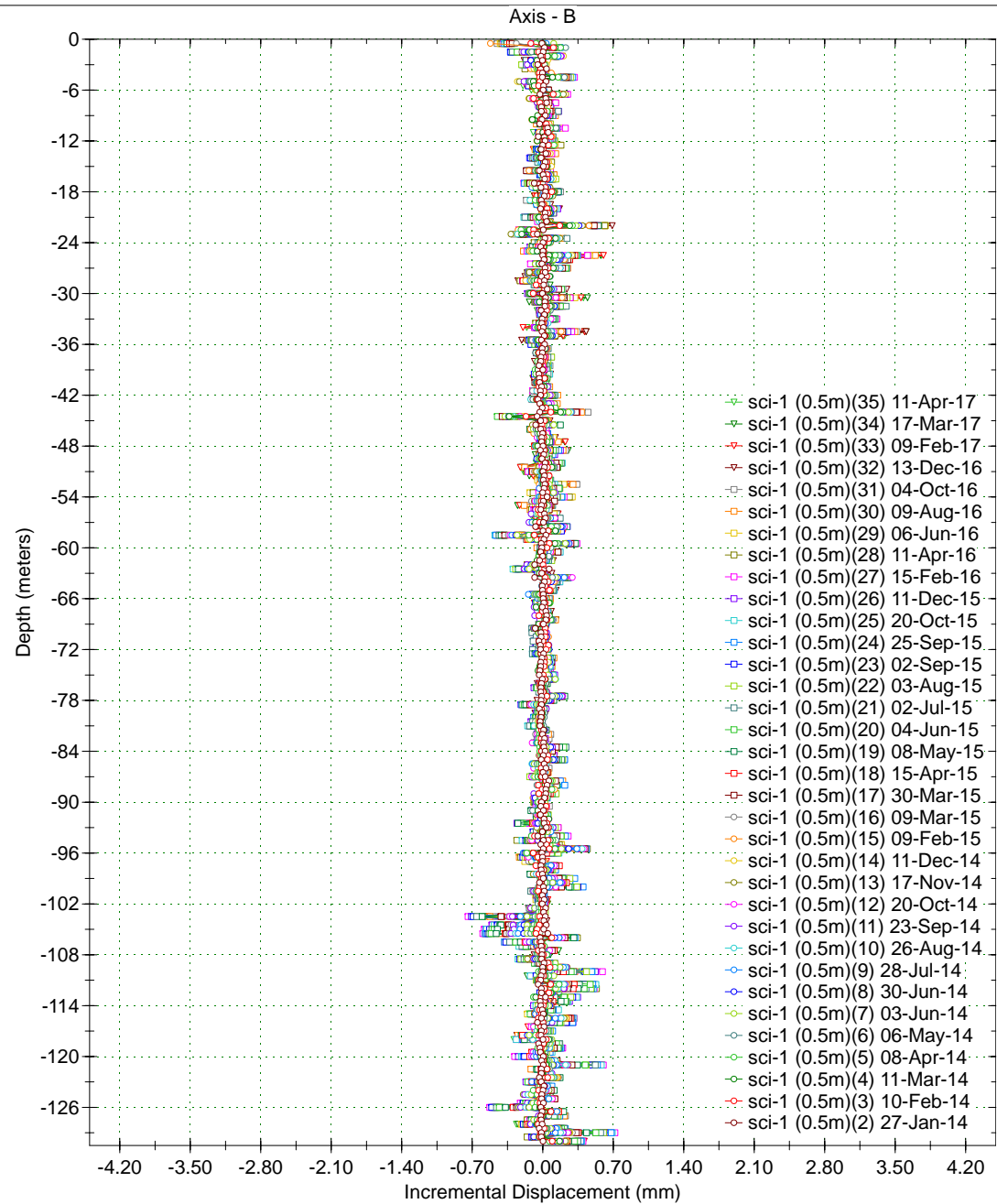
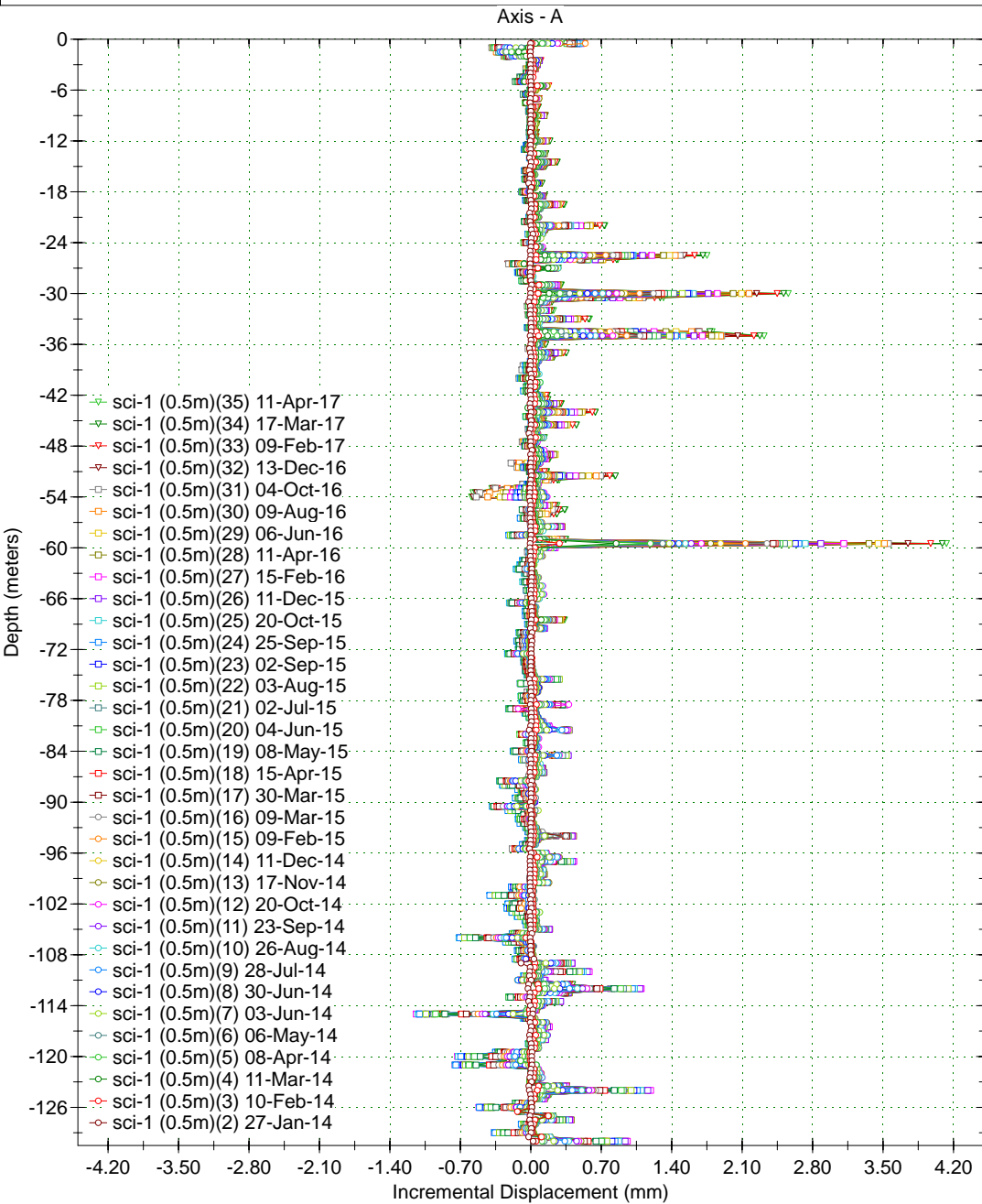


ANEJO N° 4

Gráficos Inclínométricos

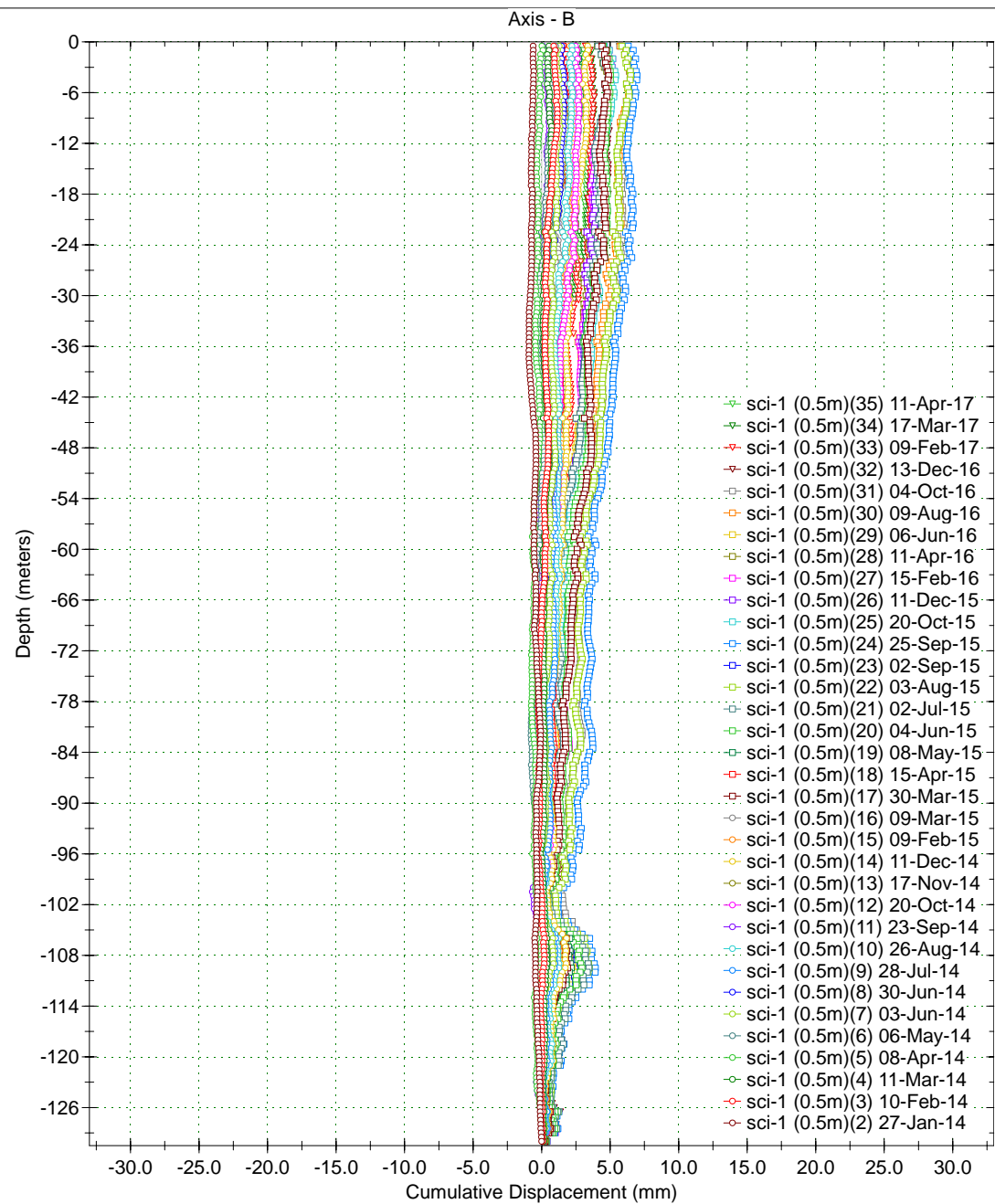
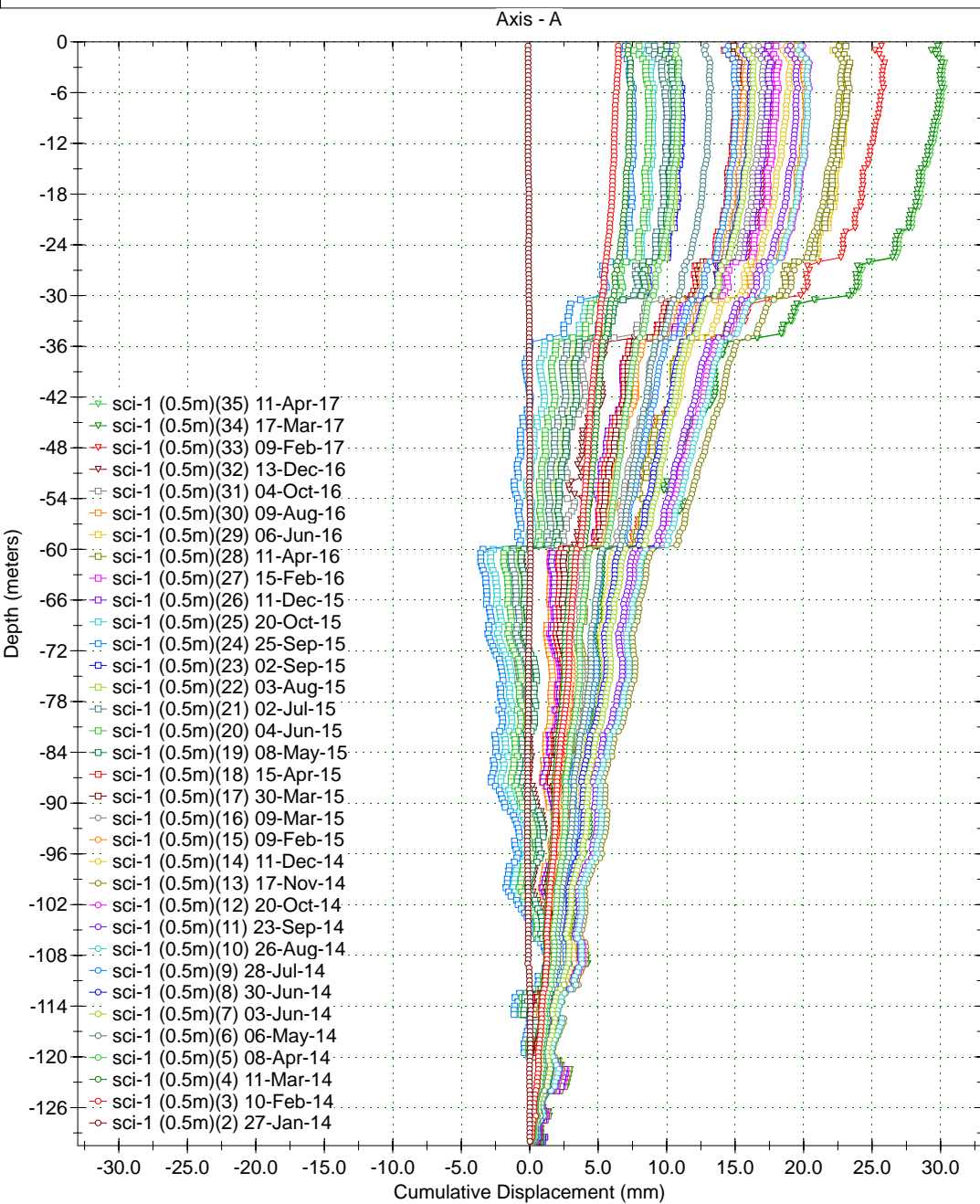
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Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 130.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 27 11:15
Applied Azimuth : 0.0 degrees



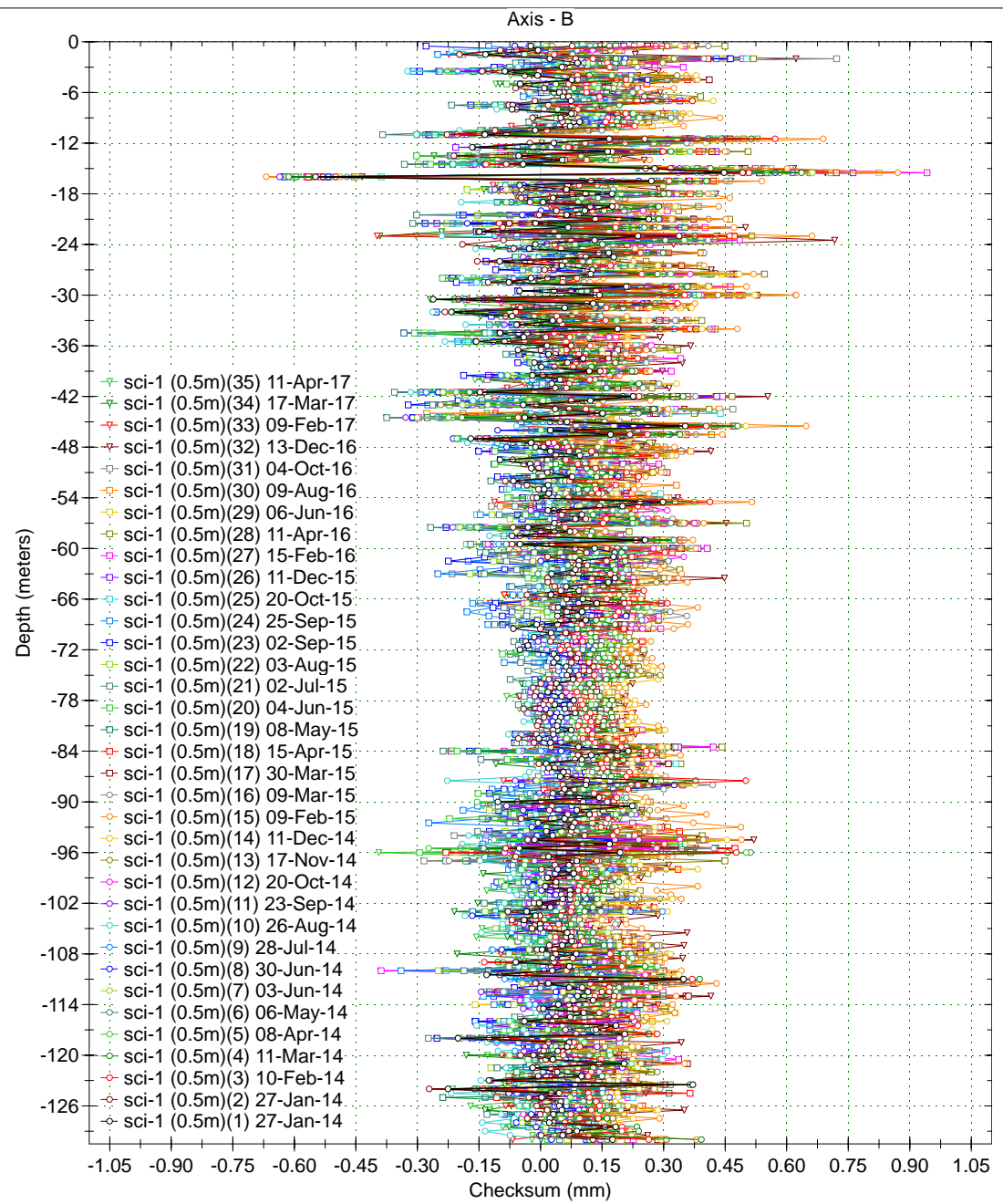
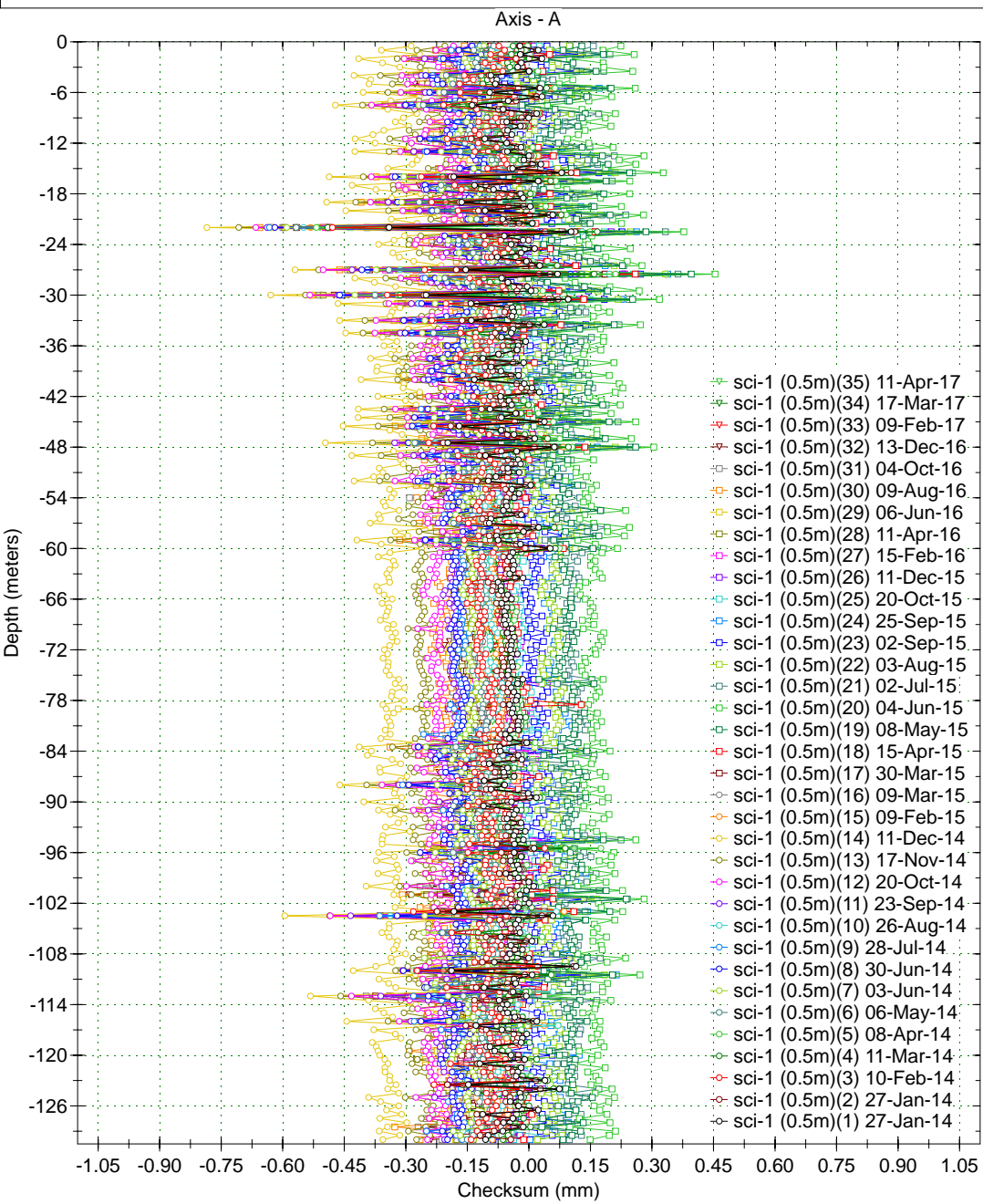
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Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
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Borehole Total Depth : 130.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 27 11:15
Applied Azimuth : 0.0 degrees



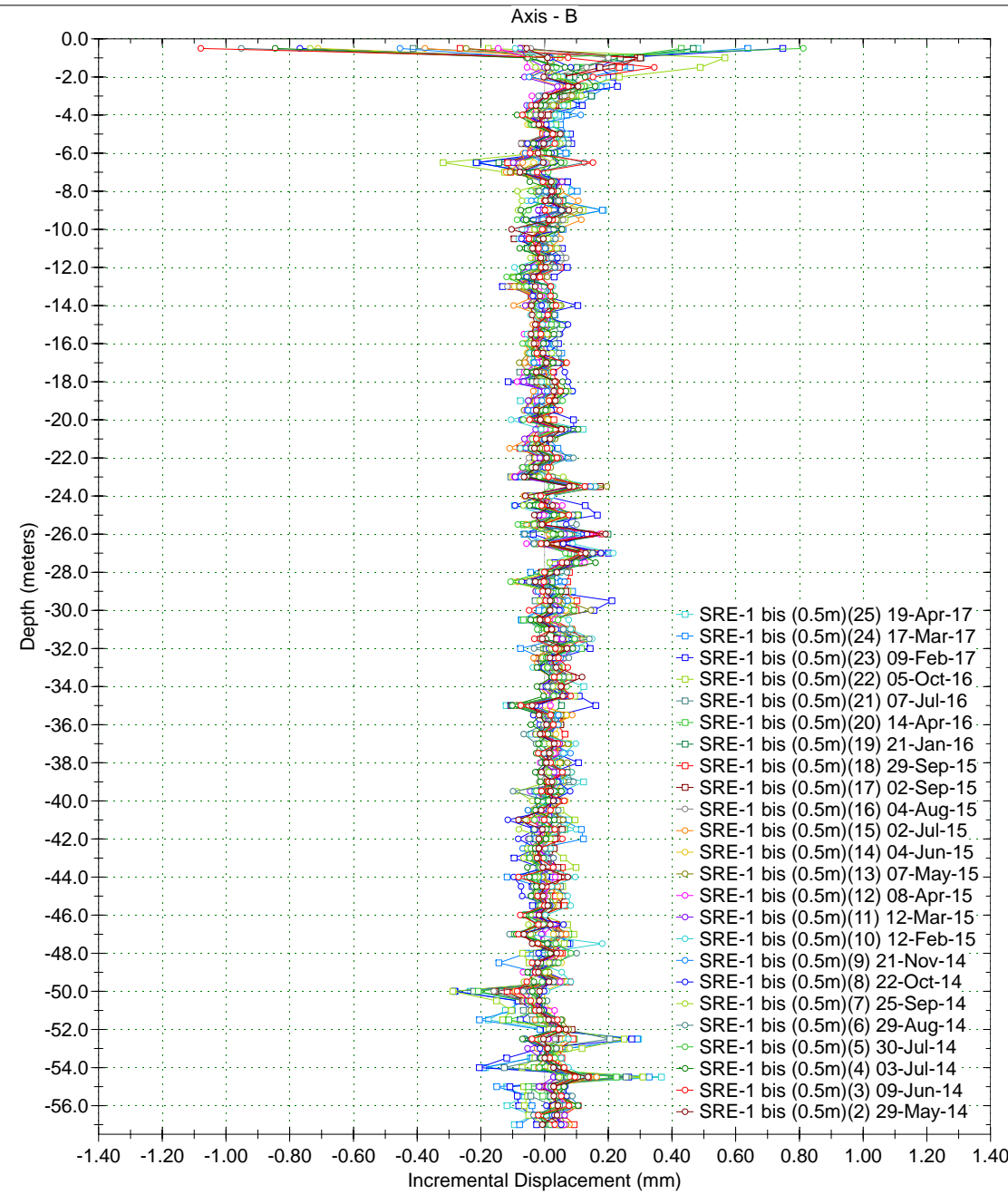
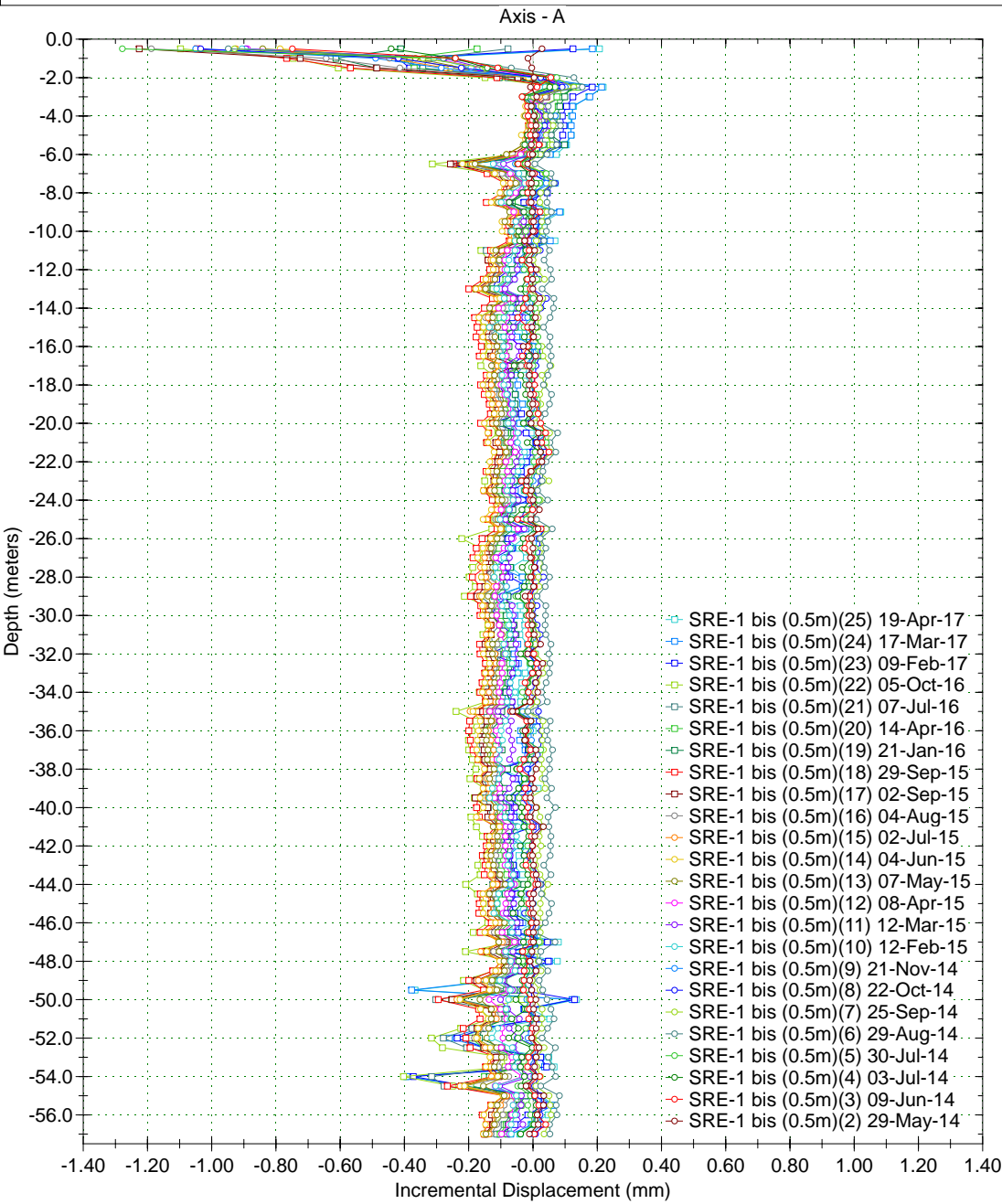
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Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
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A+ Groove Azimuth :
Base Reading : 2014 Jan 27 11:15
Applied Azimuth : 0.0 degrees



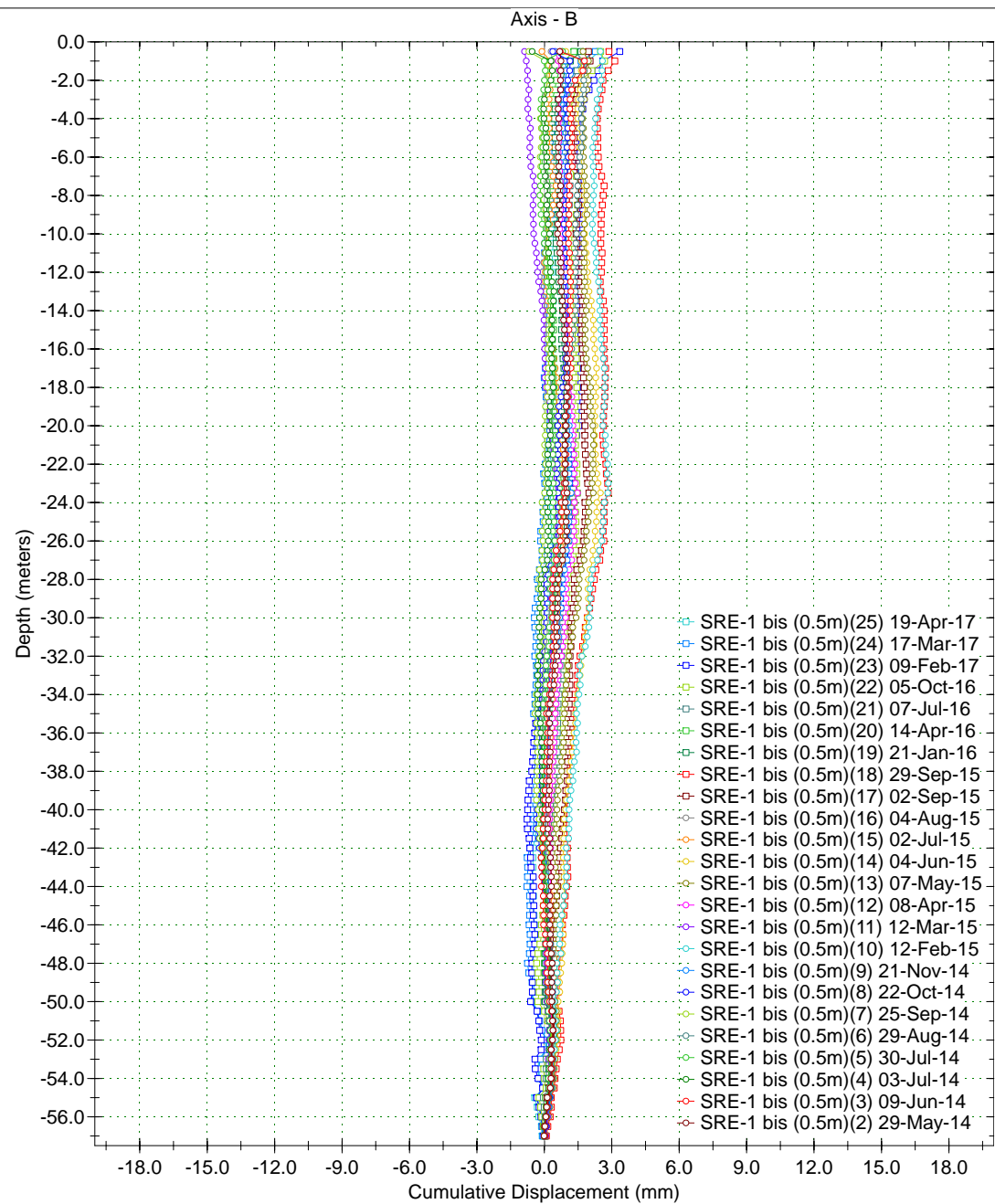
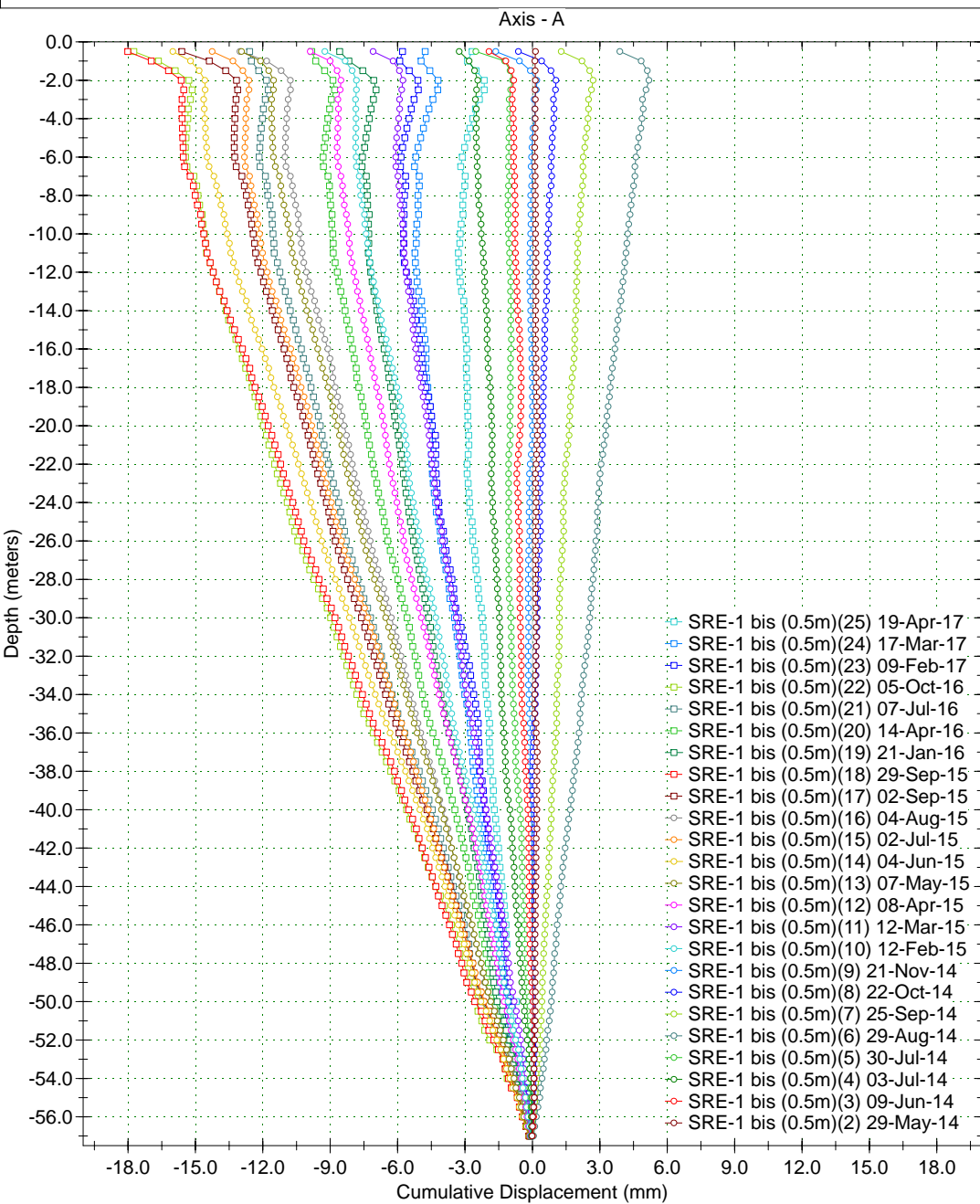
Borehole : SRE-1 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 57.0 meters
A+ Groove Azimuth :
Base Reading : 2014 May 29 16:44
Applied Azimuth : 0.0 degrees



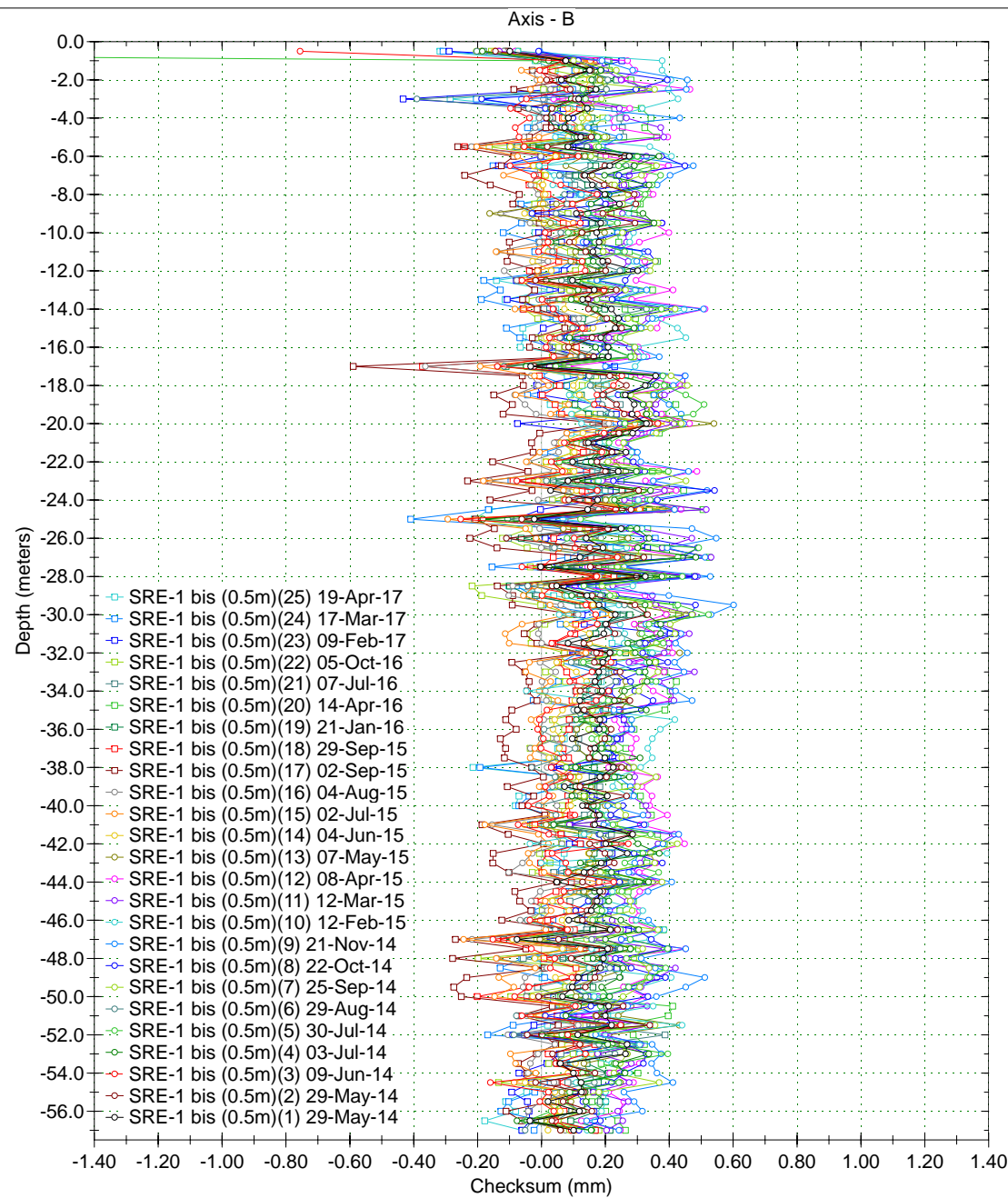
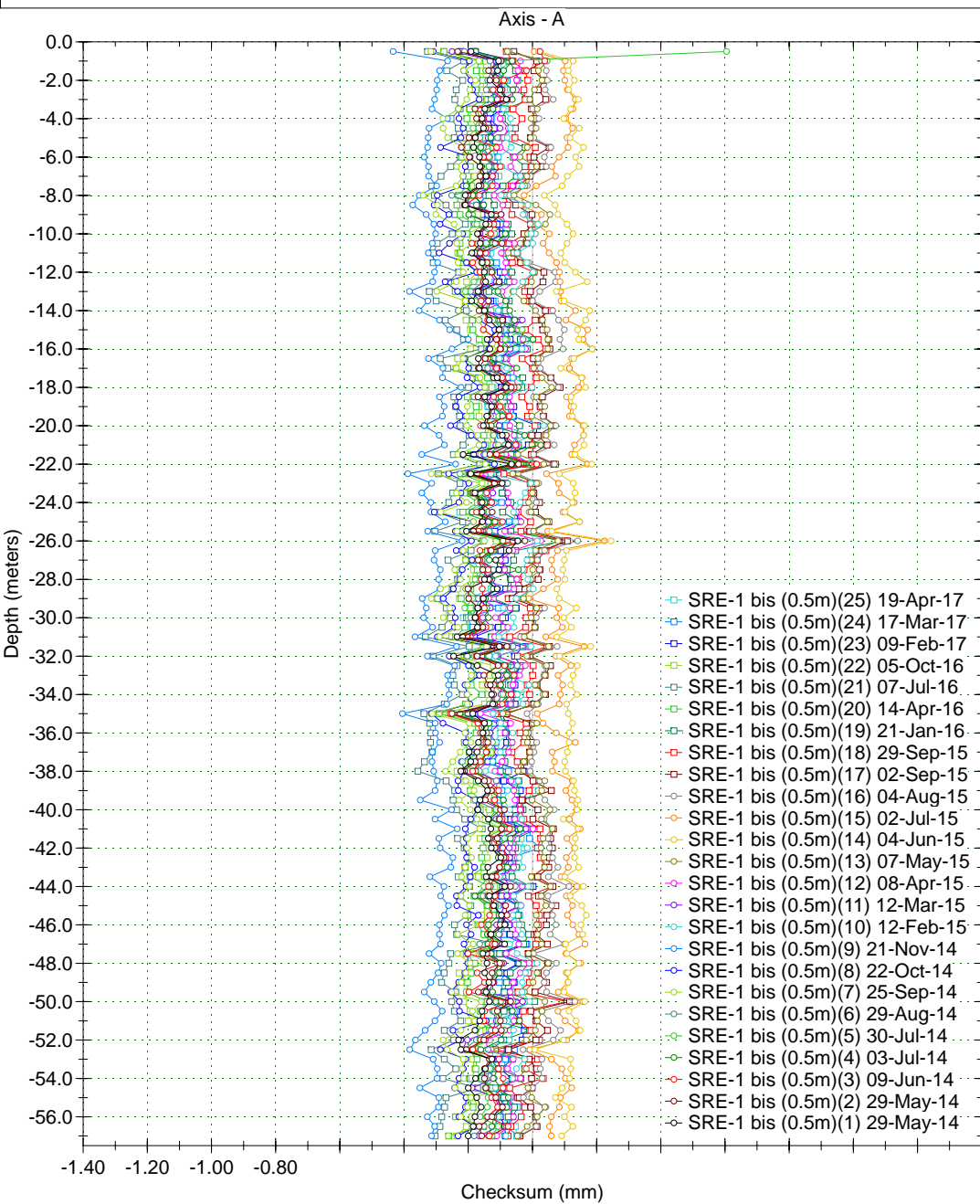
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 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

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 A+ Groove Azimuth :
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 Applied Azimuth : 0.0 degrees



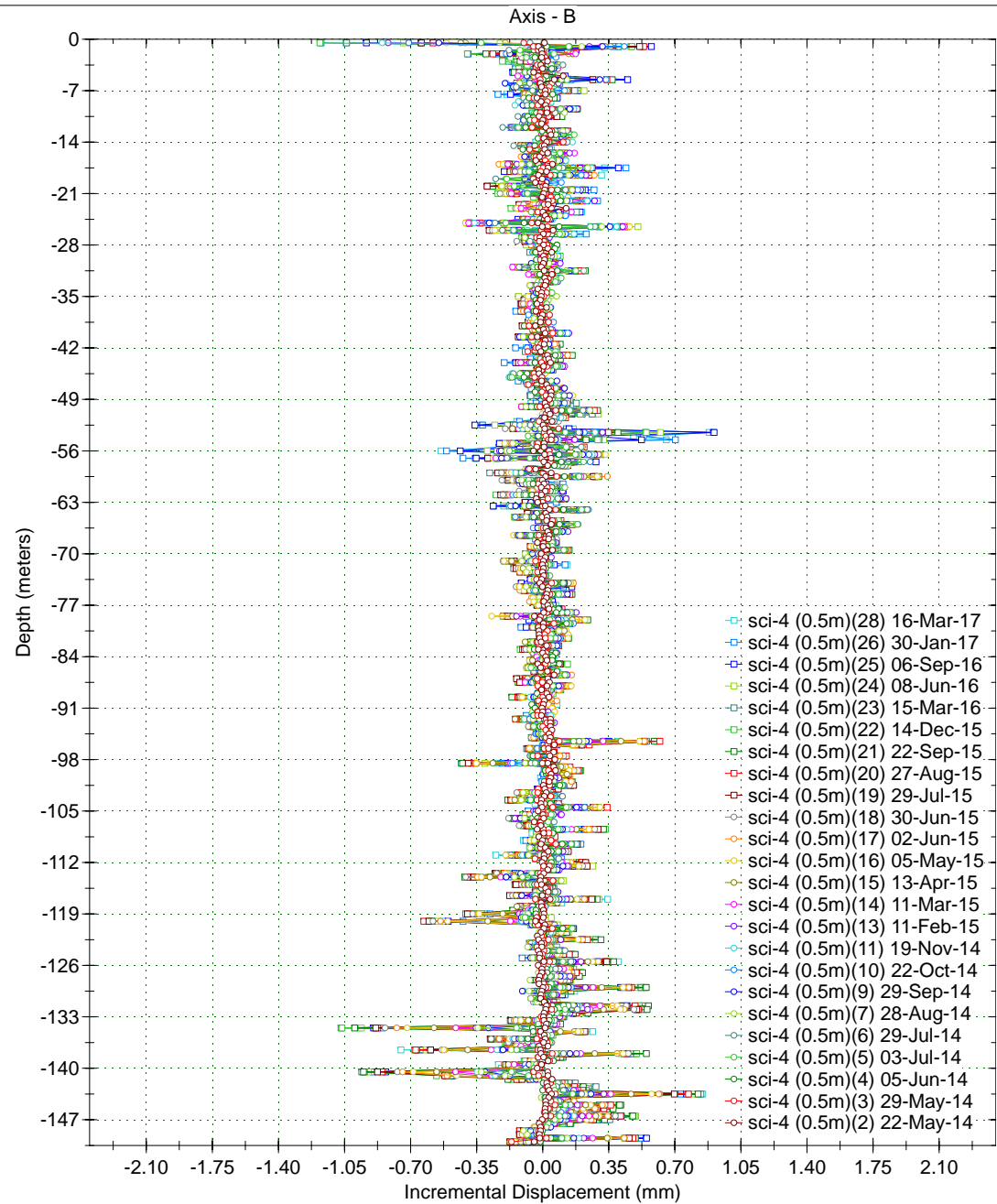
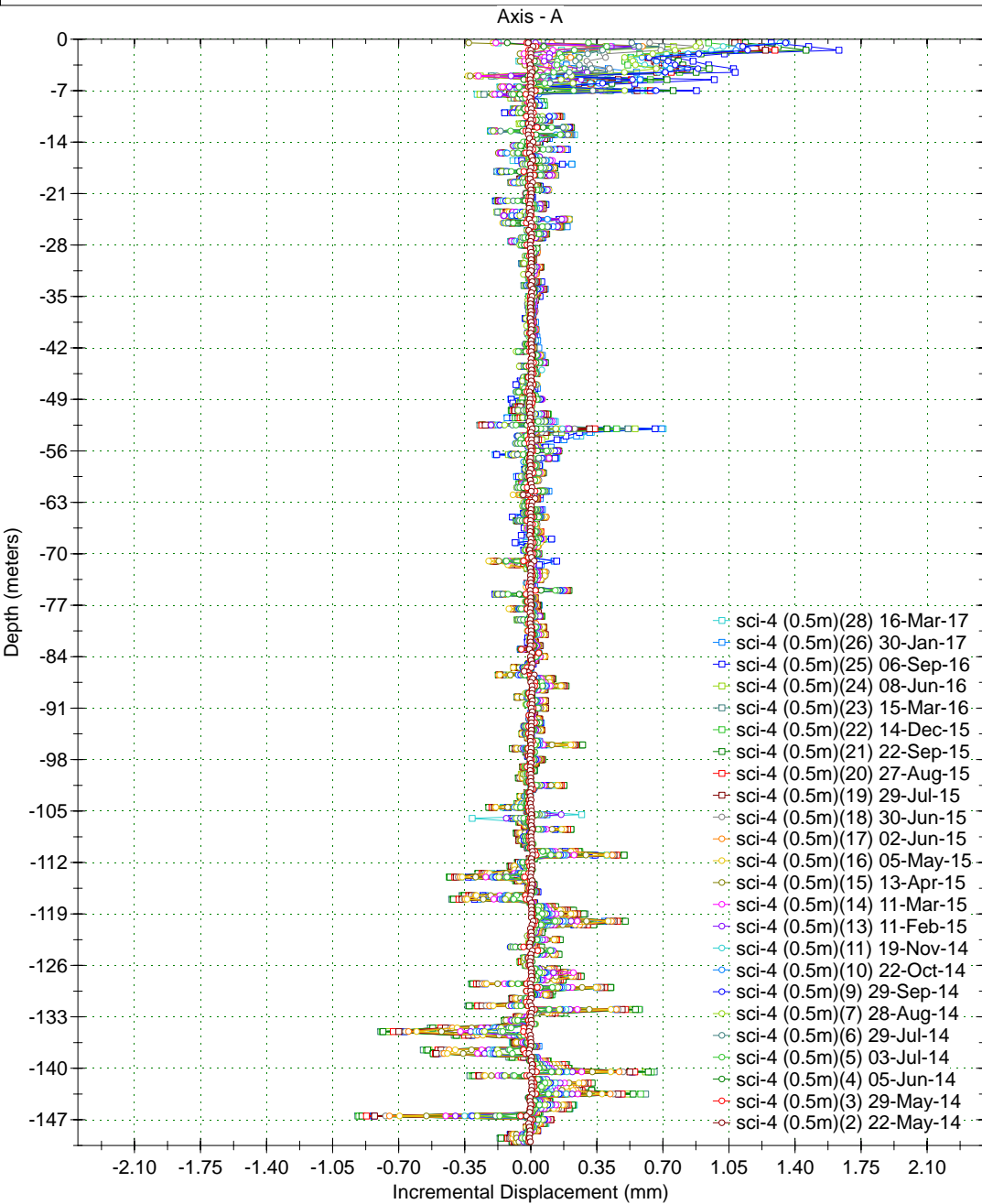
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Easting :
Collar :

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Applied Azimuth : 0.0 degrees



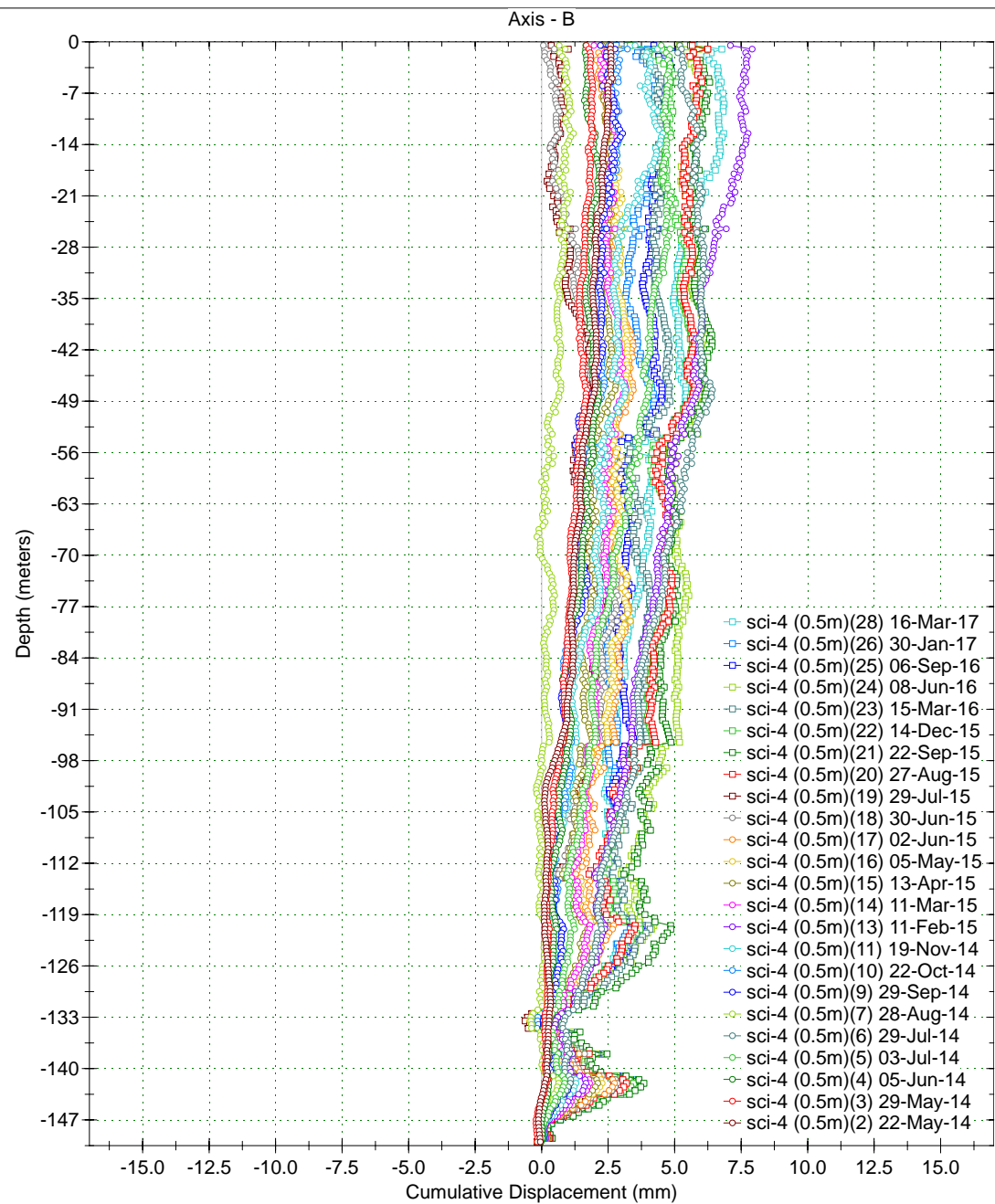
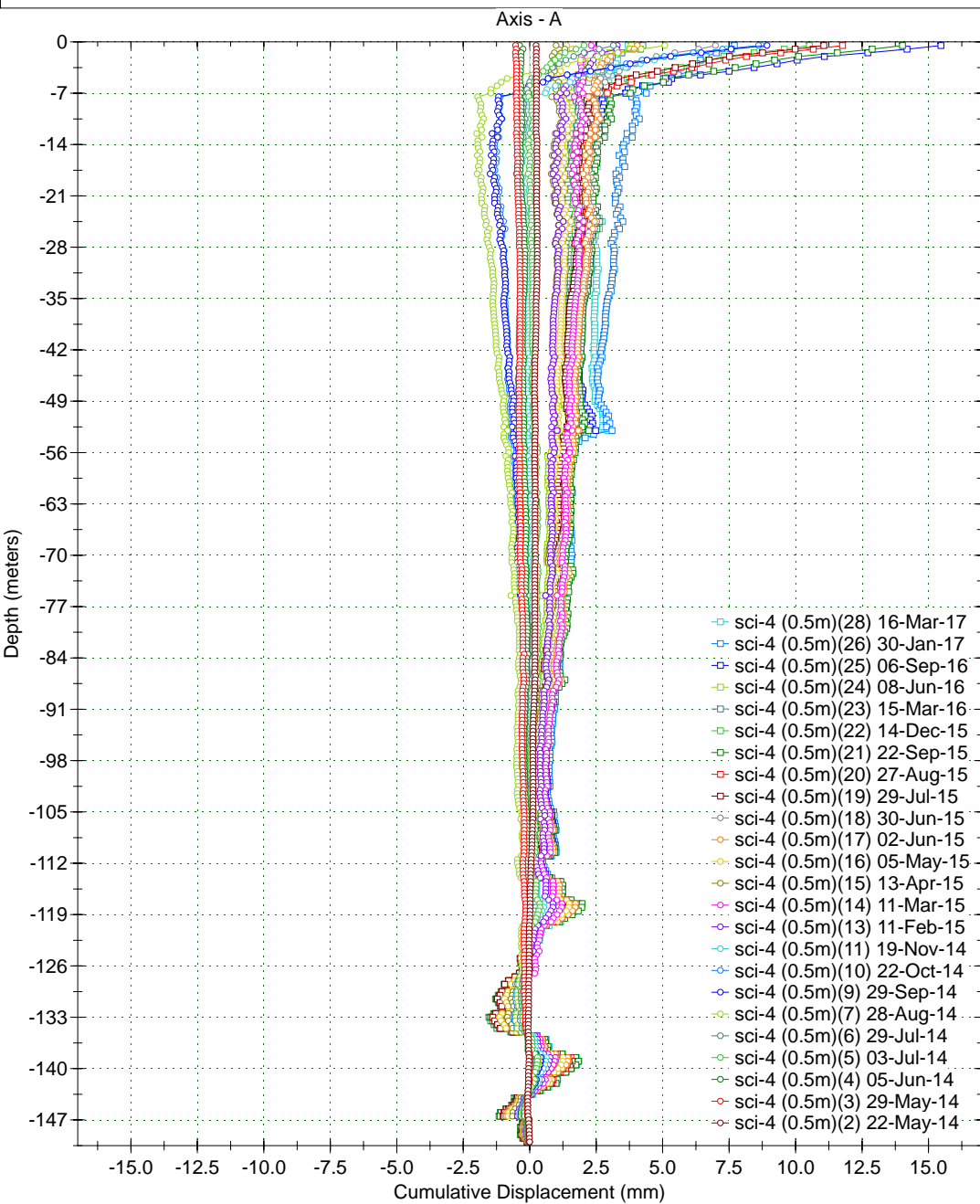
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Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 150.0 meters
A+ Groove Azimuth :
Base Reading : 2014 May 22 11:03
Applied Azimuth : 0.0 degrees



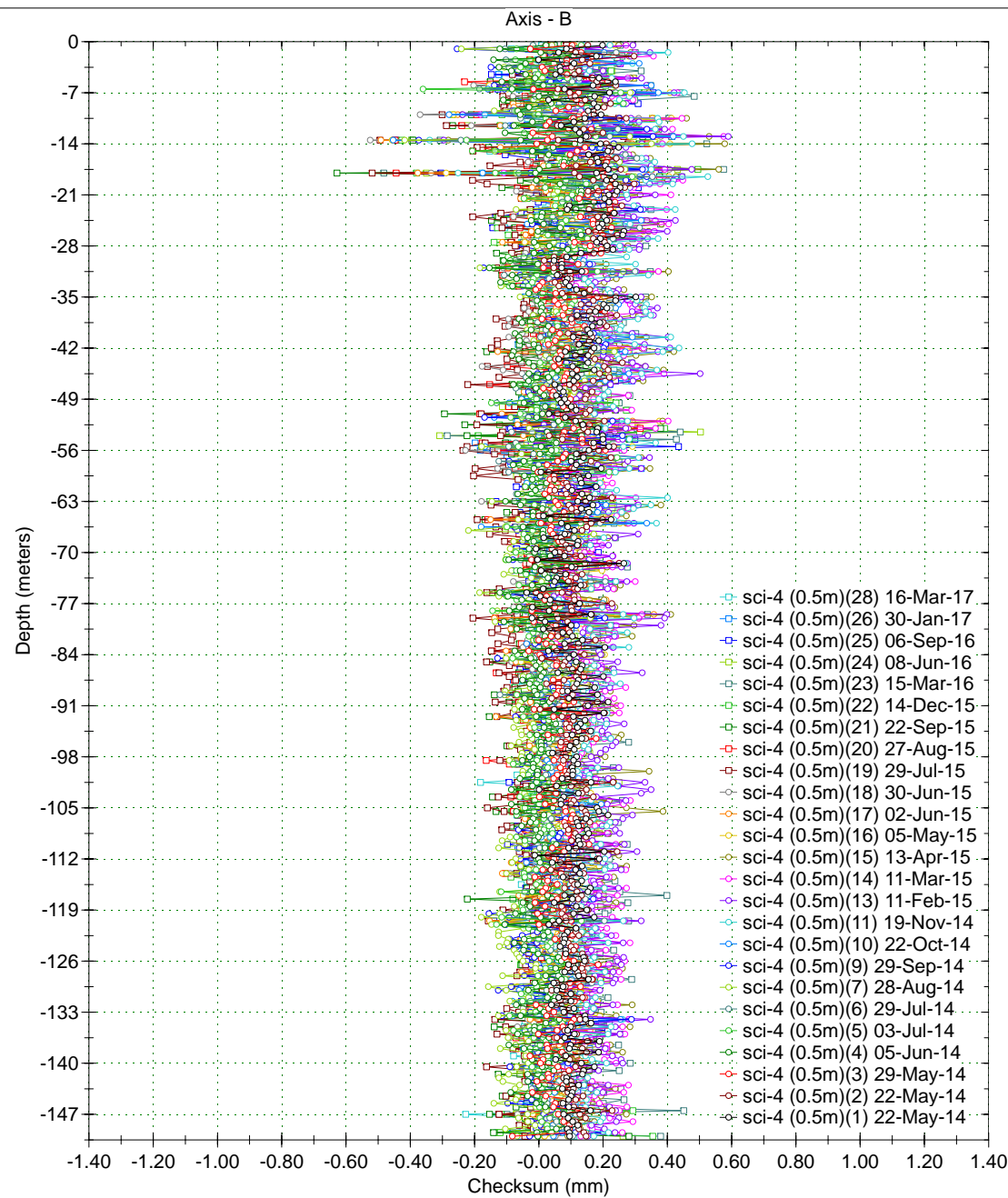
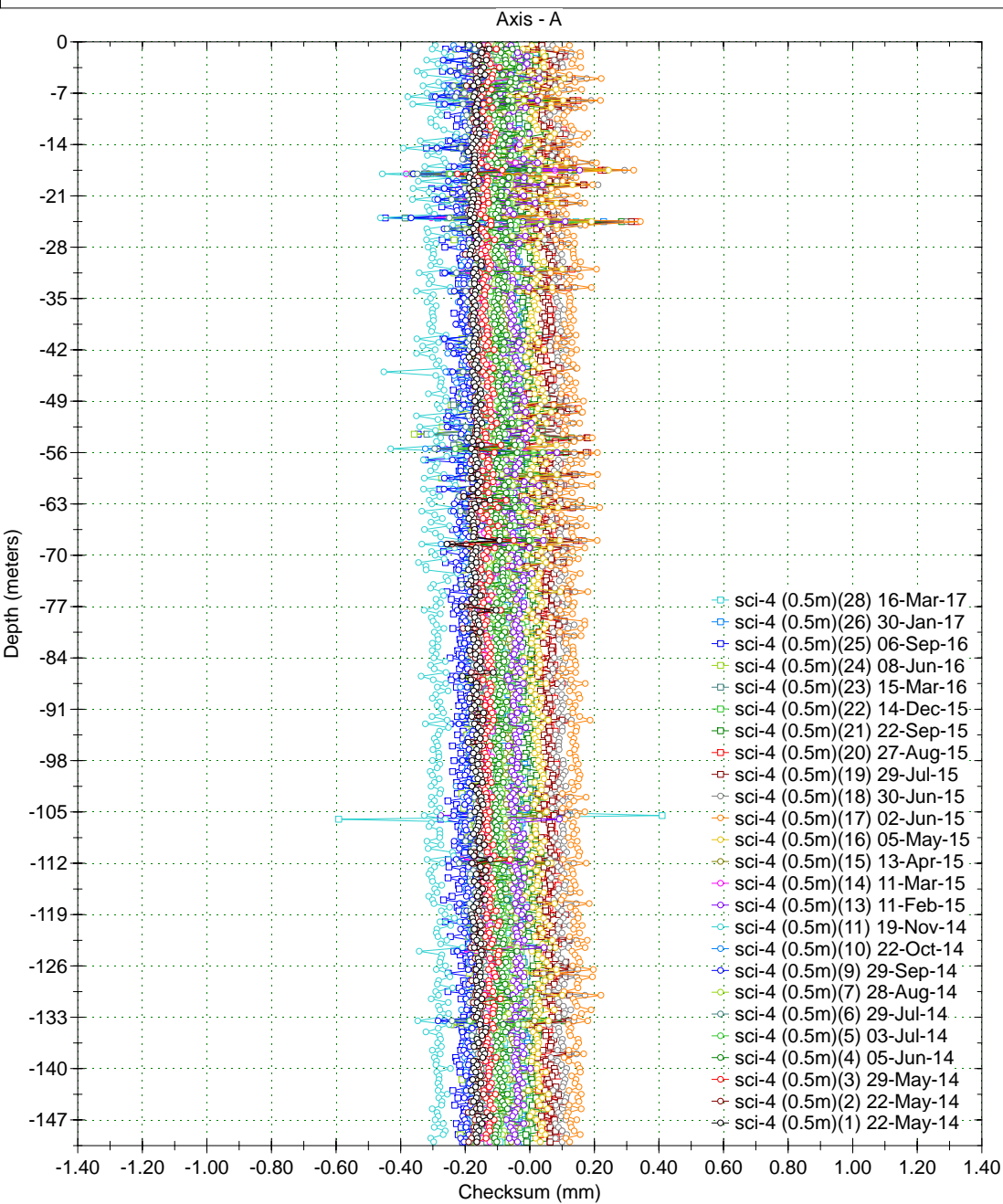
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Northing :
Easting :
Collar :

Spiral Correction : N/A
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A+ Groove Azimuth :
Base Reading : 2014 May 22 11:03
Applied Azimuth : 0.0 degrees



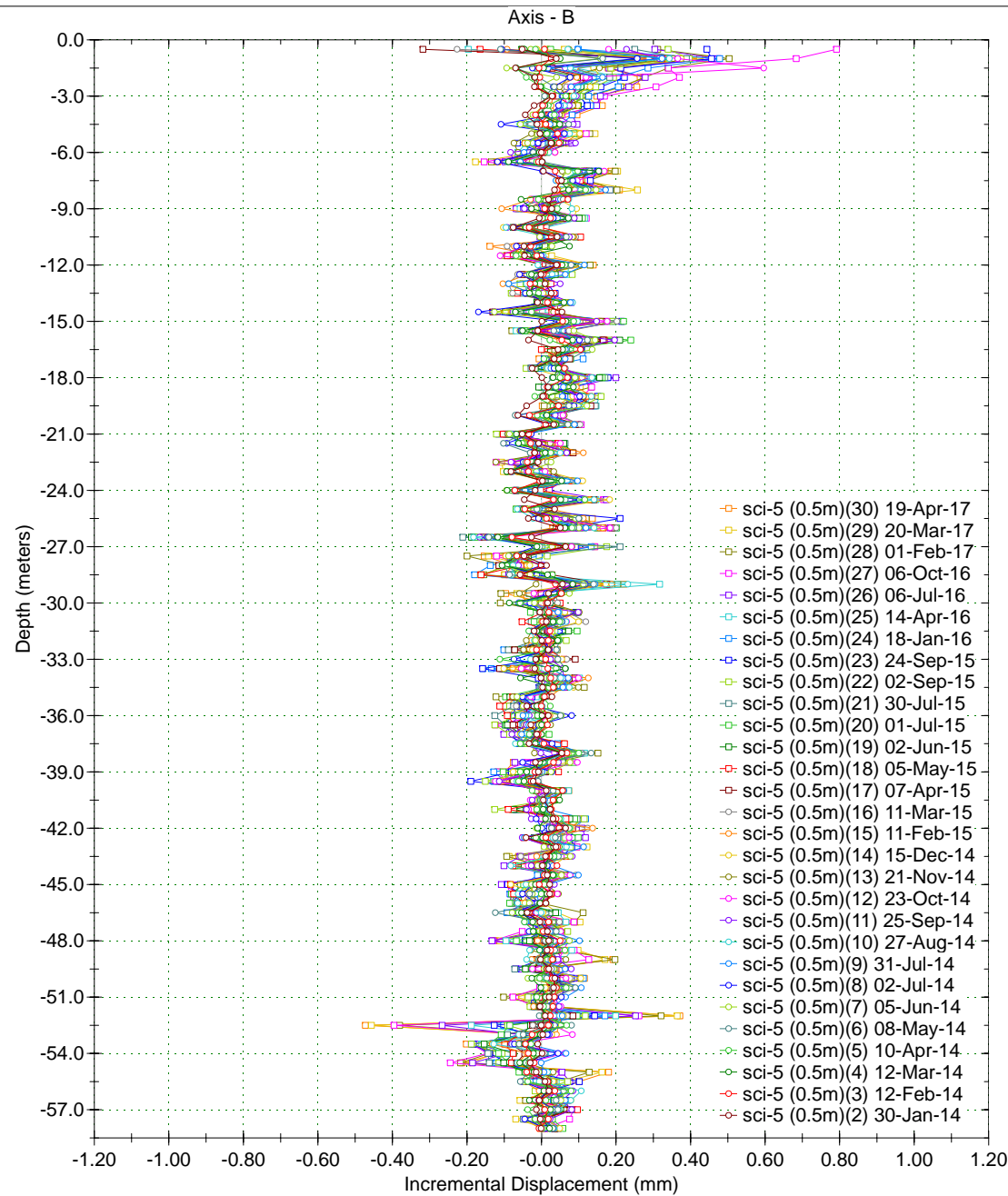
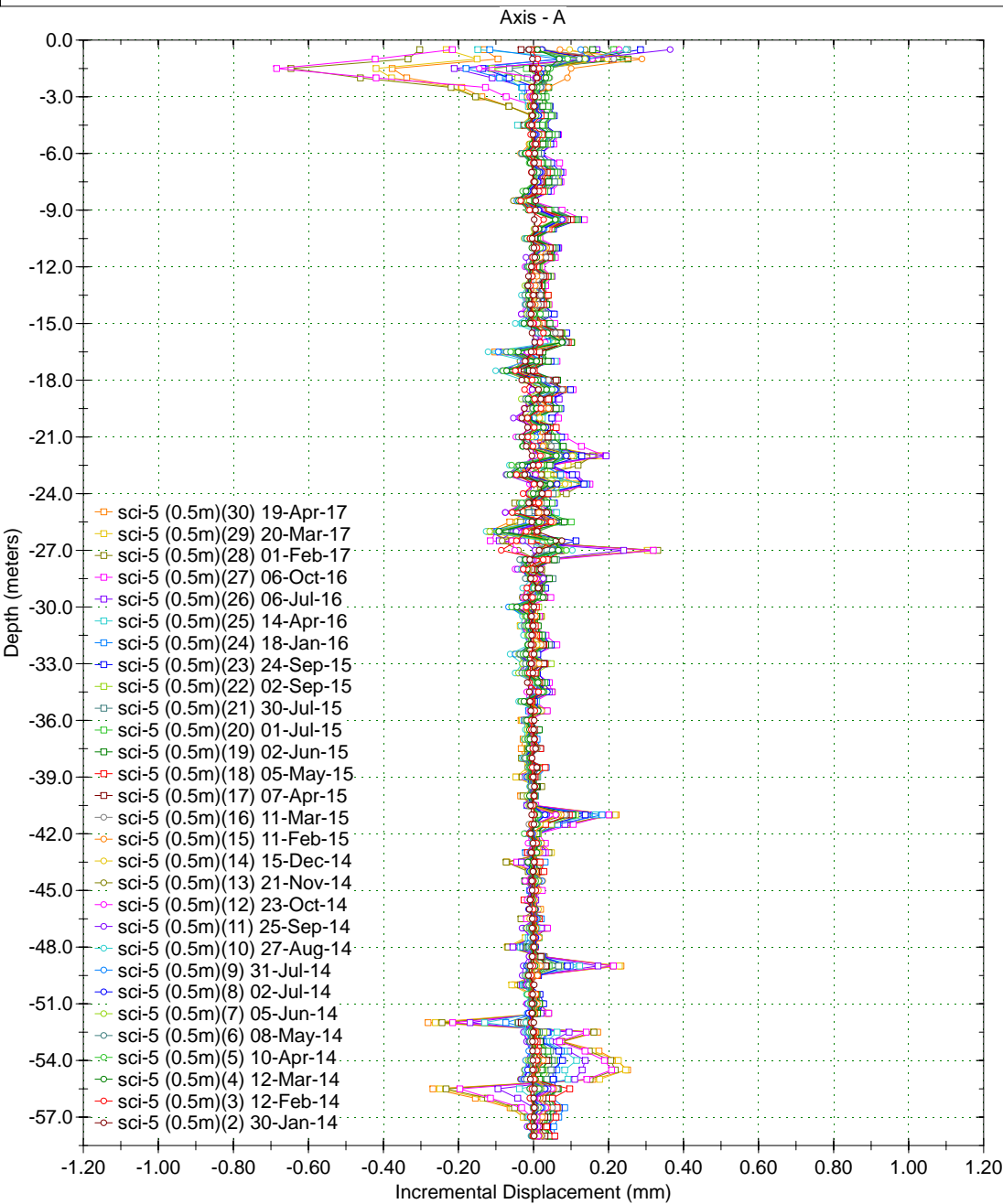
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Northing :
Easting :
Collar :

Spiral Correction : N/A
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Base Reading : 2014 May 22 11:03
Applied Azimuth : 0.0 degrees



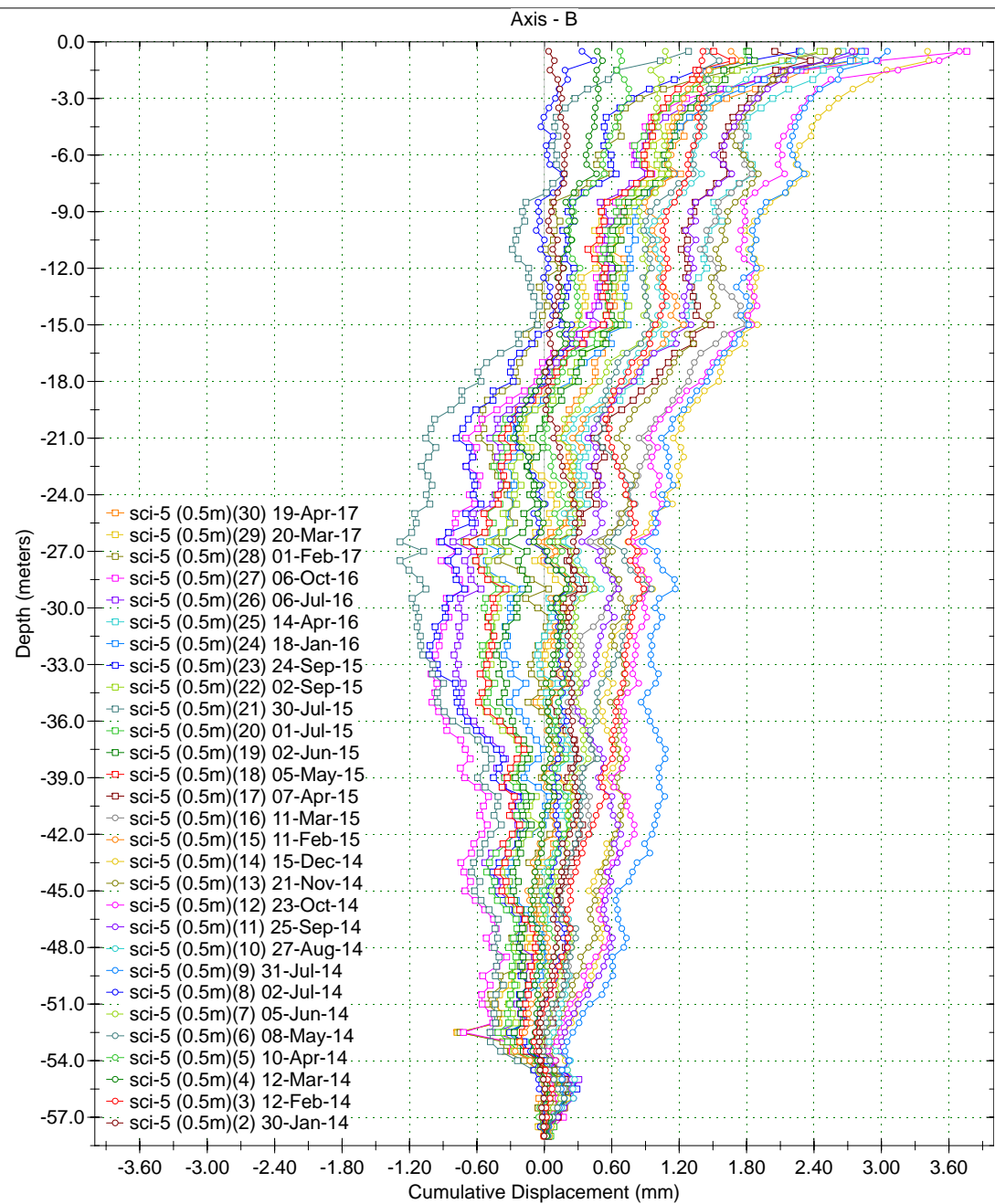
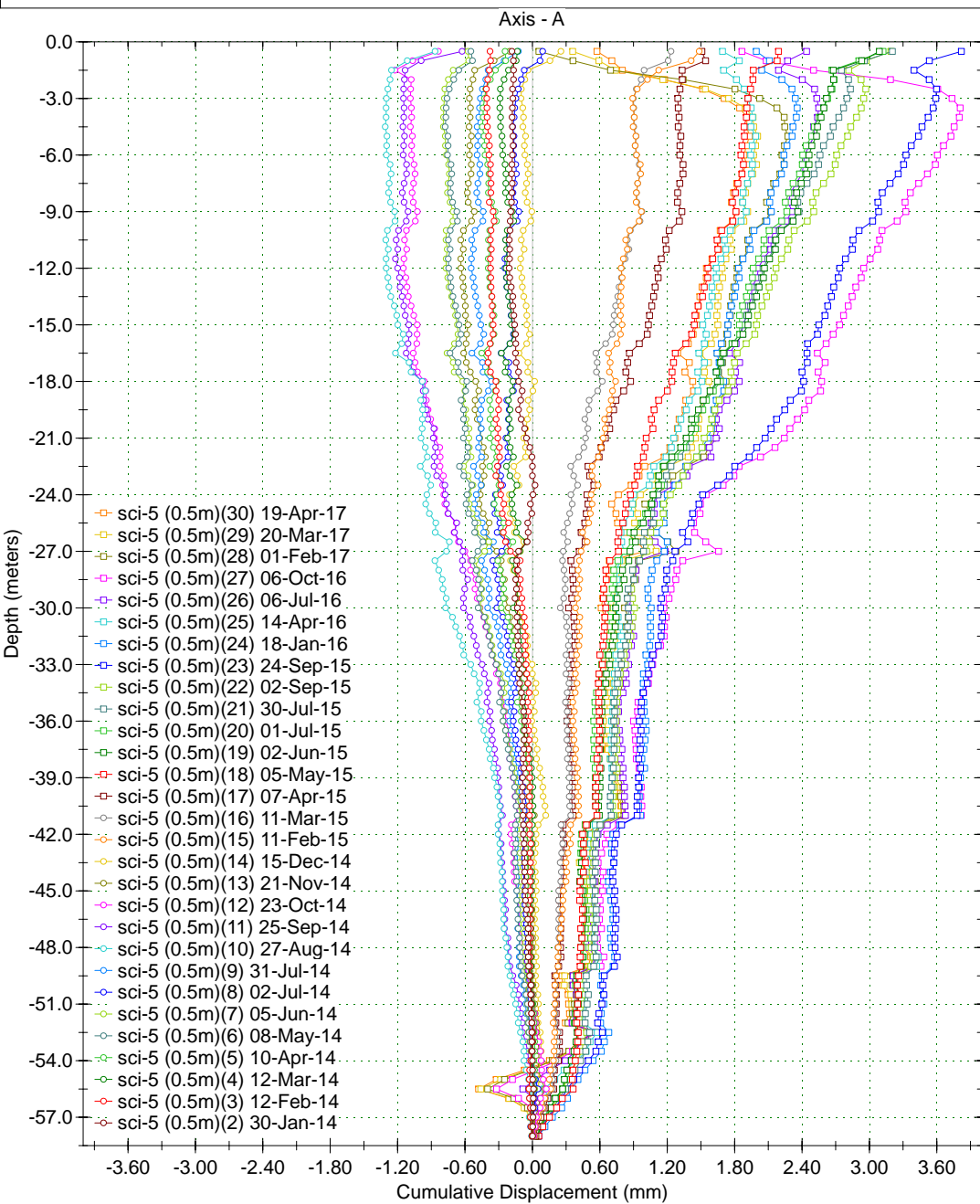
Borehole : sci-5
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 58.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jan 30 17:14
 Applied Azimuth : 0.0 degrees



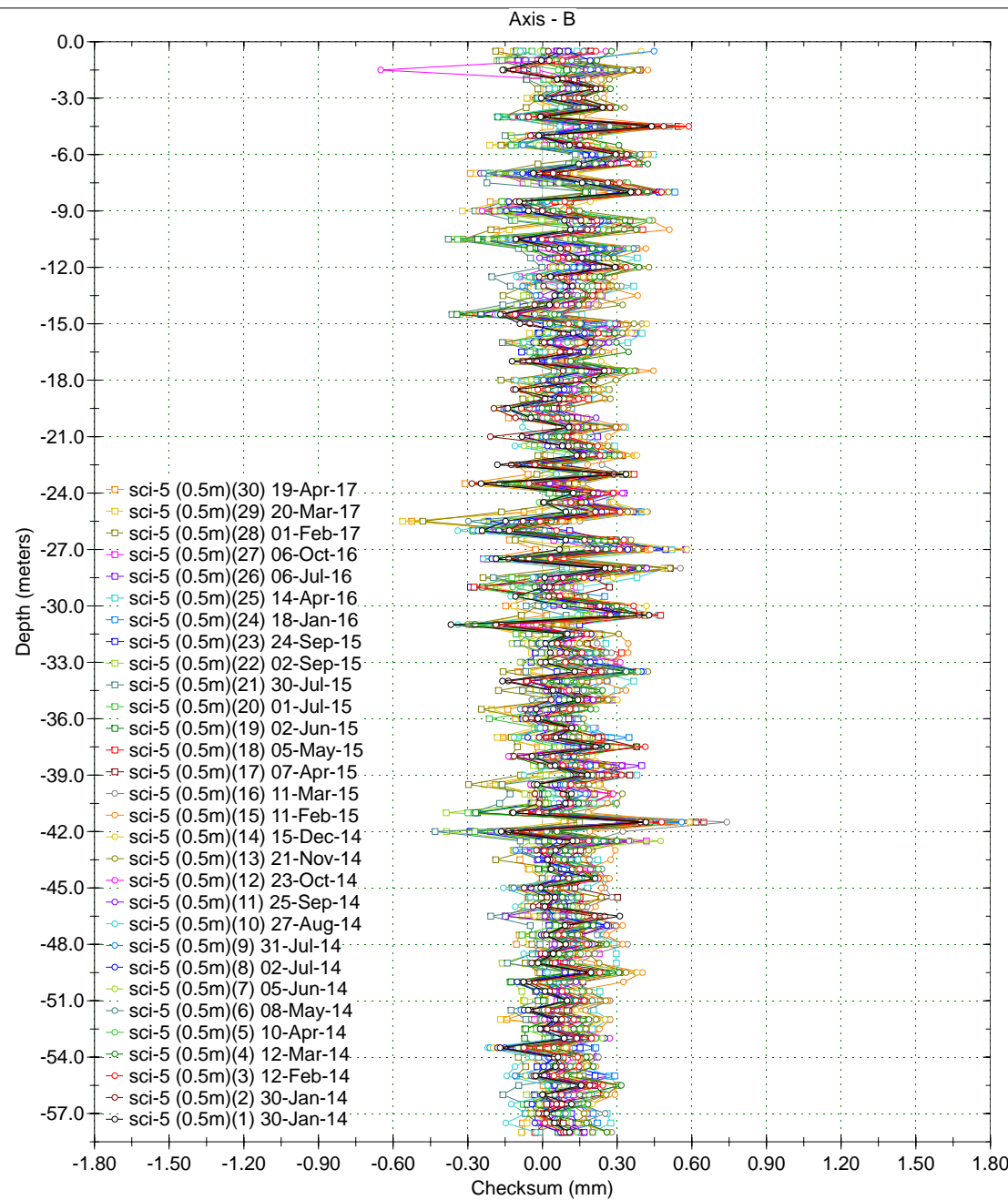
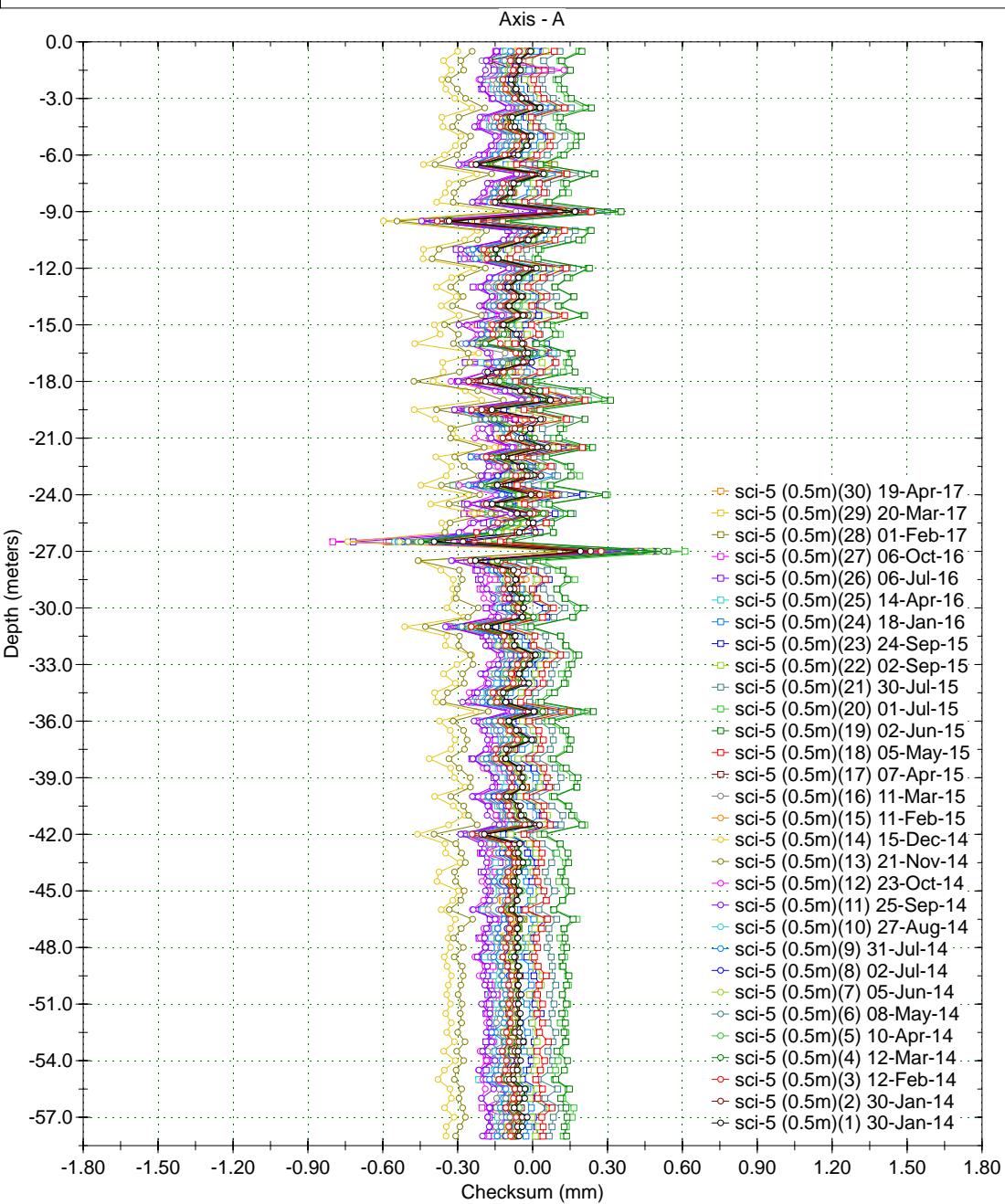
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Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 58.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 30 17:14
Applied Azimuth : 0.0 degrees



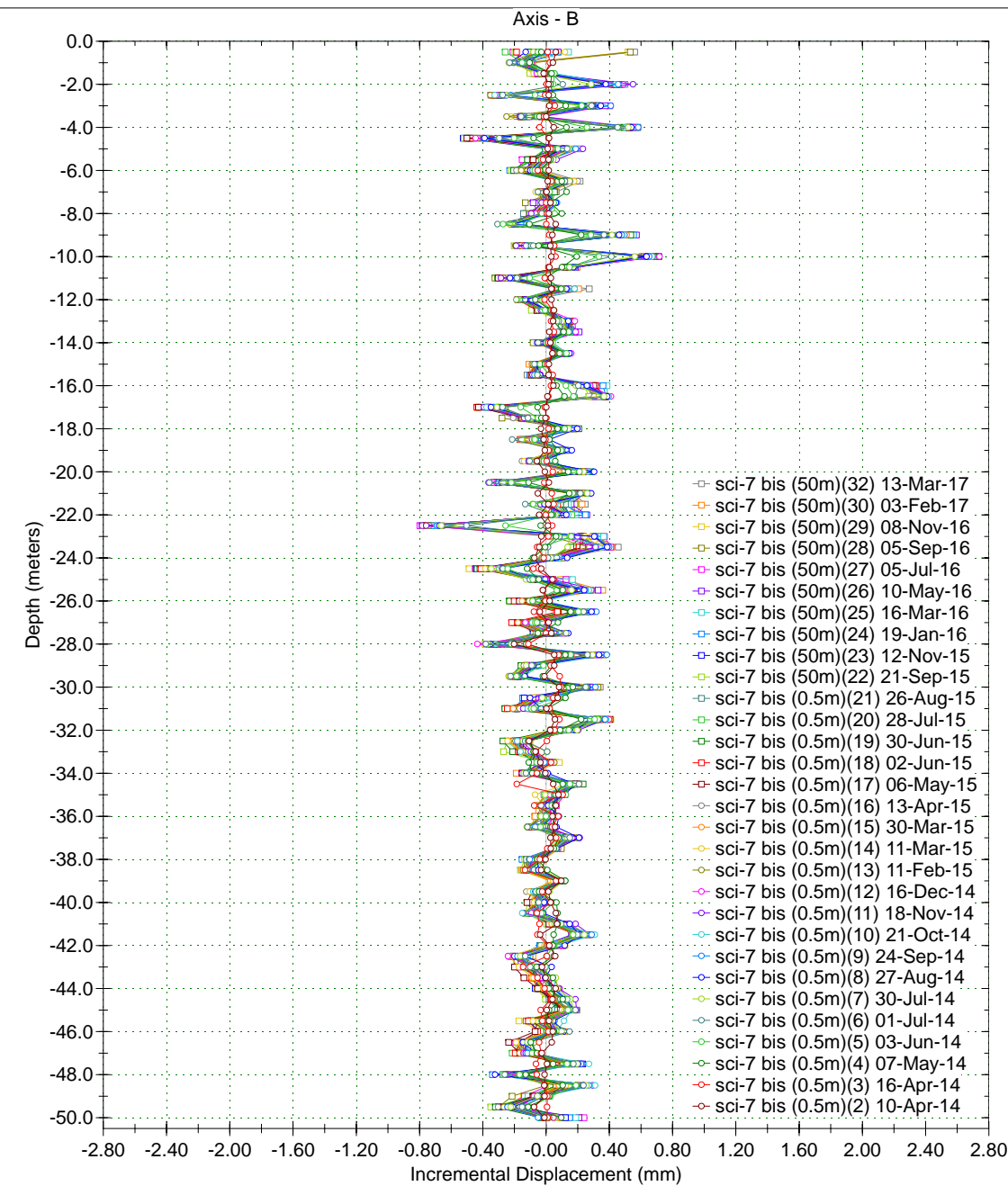
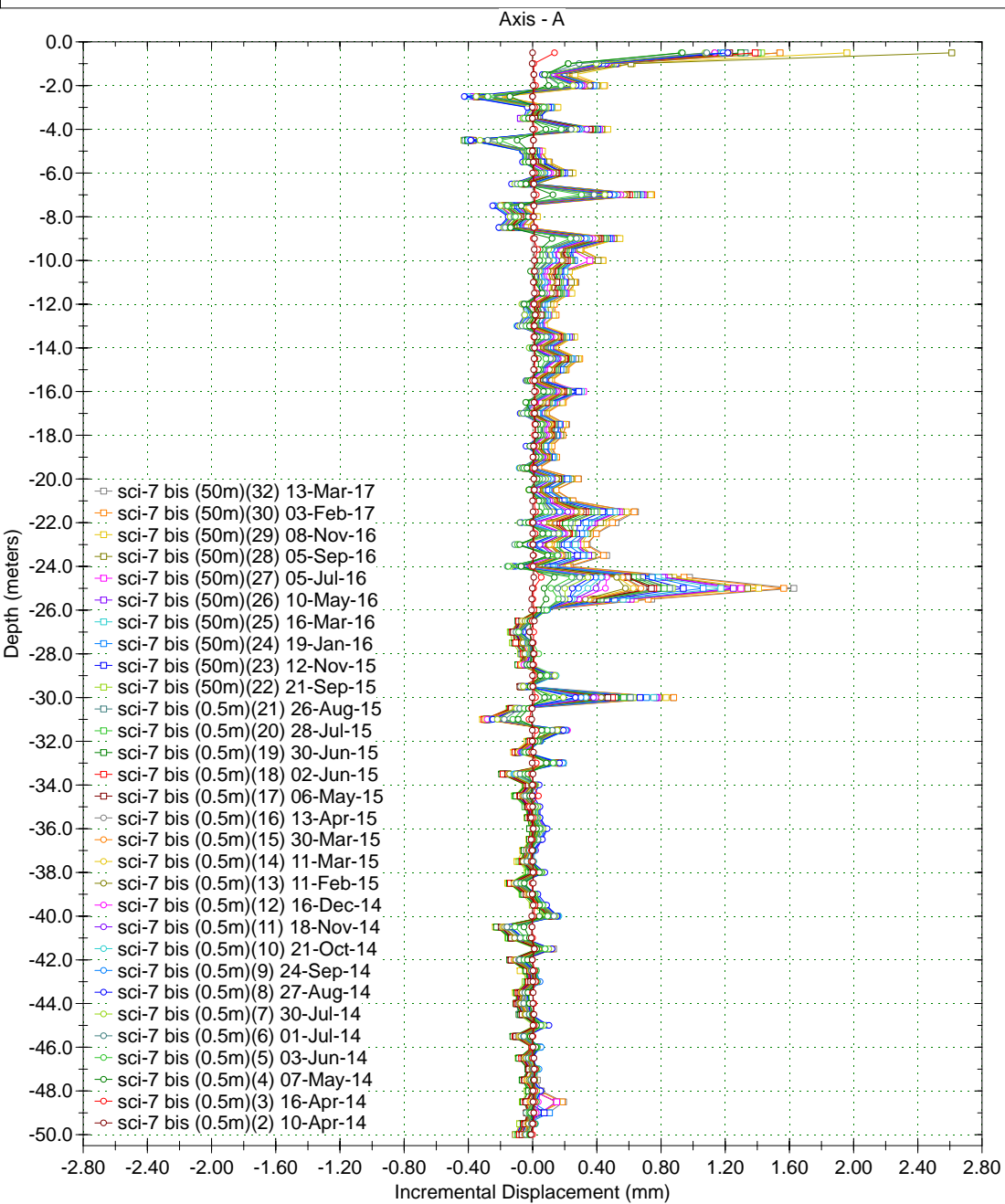
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Location :
Northing :
Easting :
Collar :

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A+ Groove Azimuth :
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Applied Azimuth : 0.0 degrees



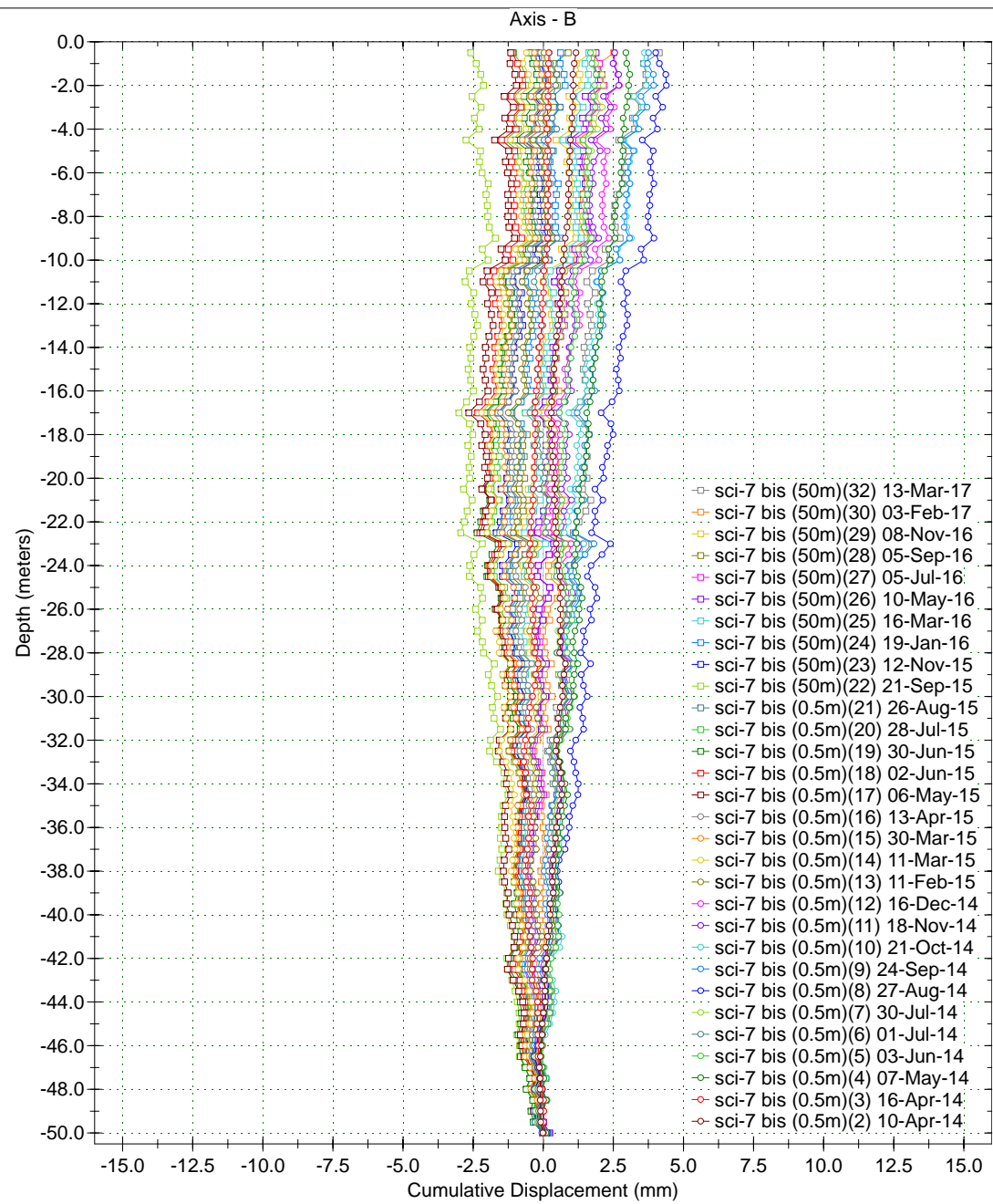
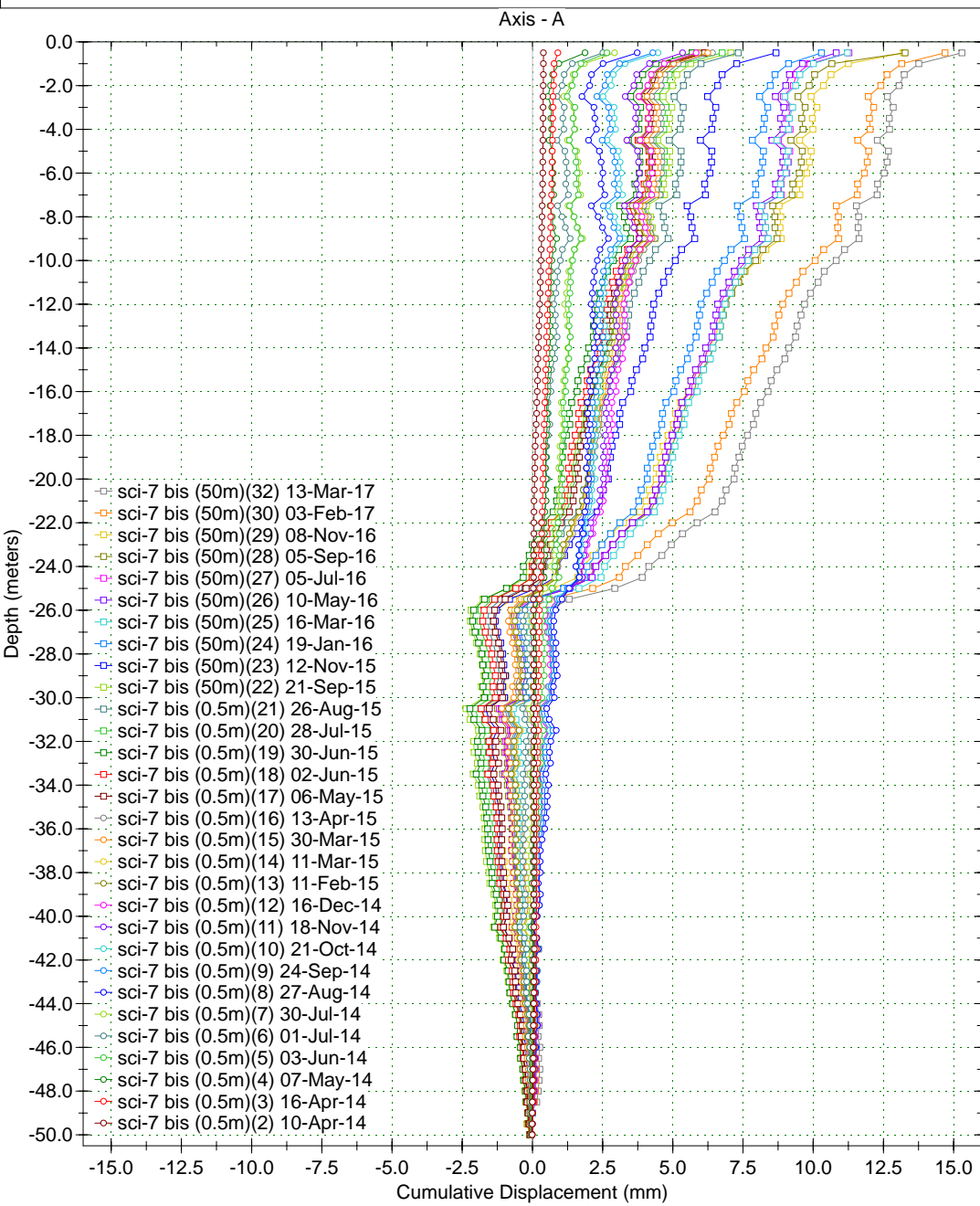
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Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
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Borehole Total Depth : 50.0 meters
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Applied Azimuth : 0.0 degrees



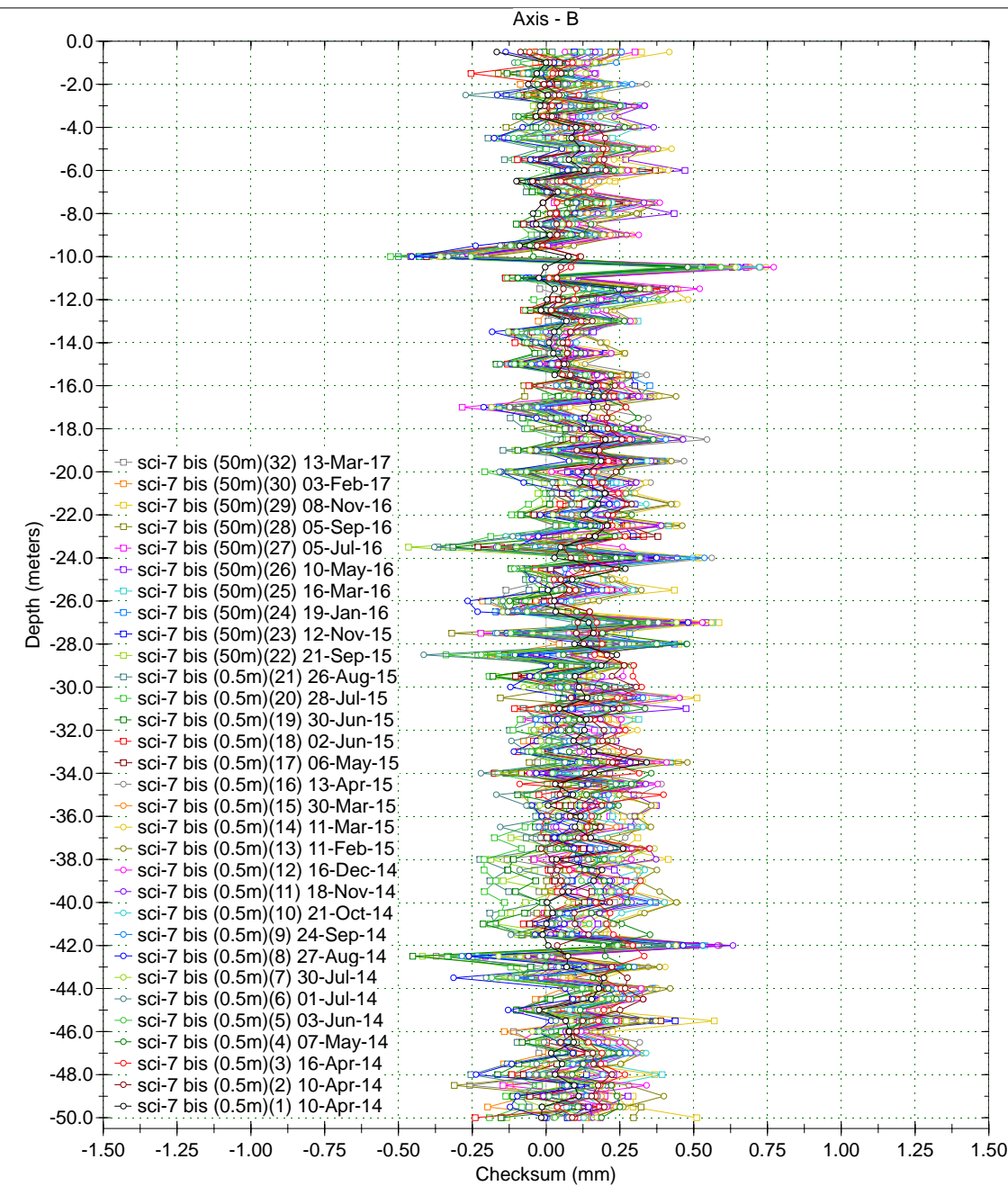
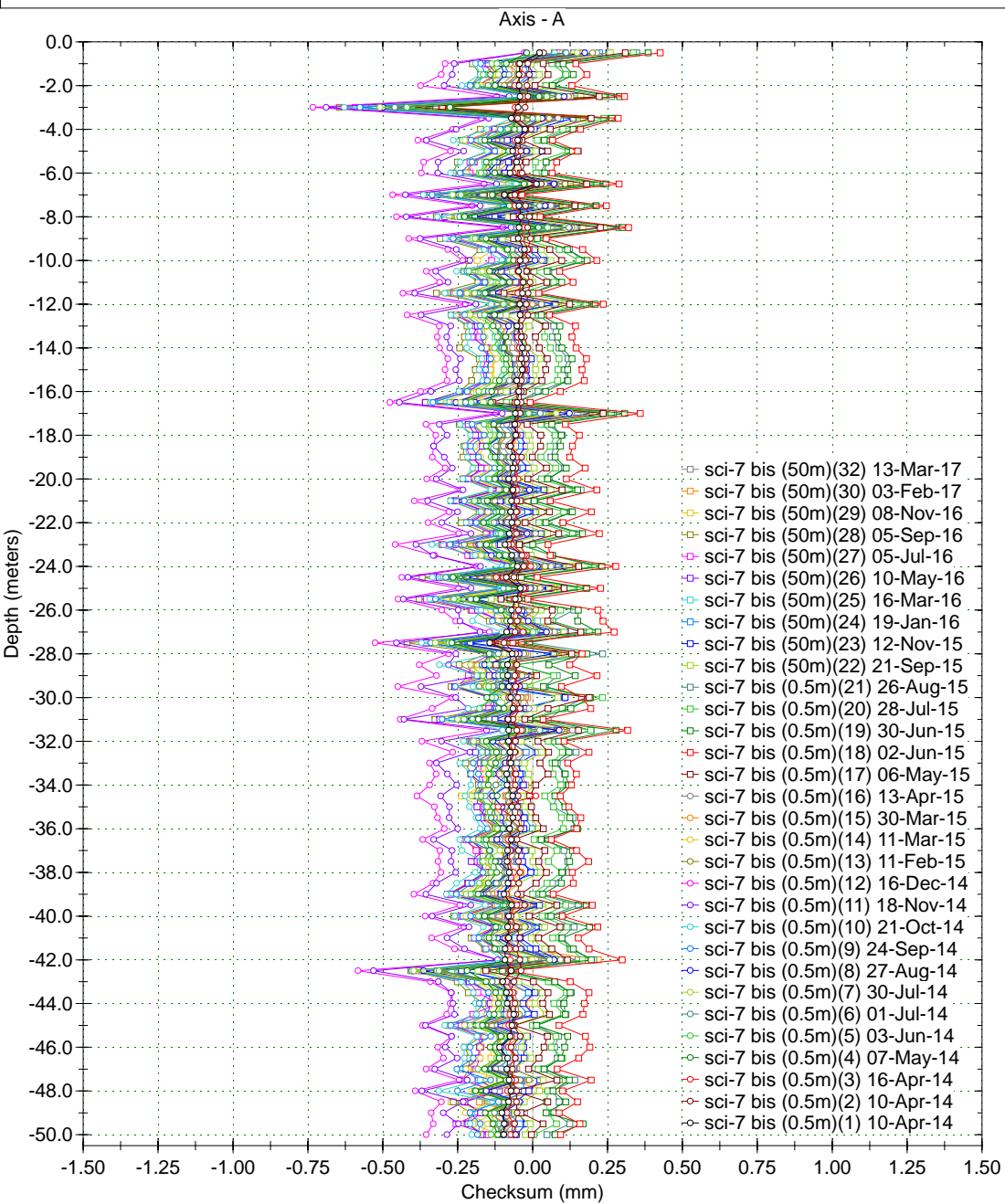
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Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 50.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Apr 10 16:52
Applied Azimuth : 0.0 degrees



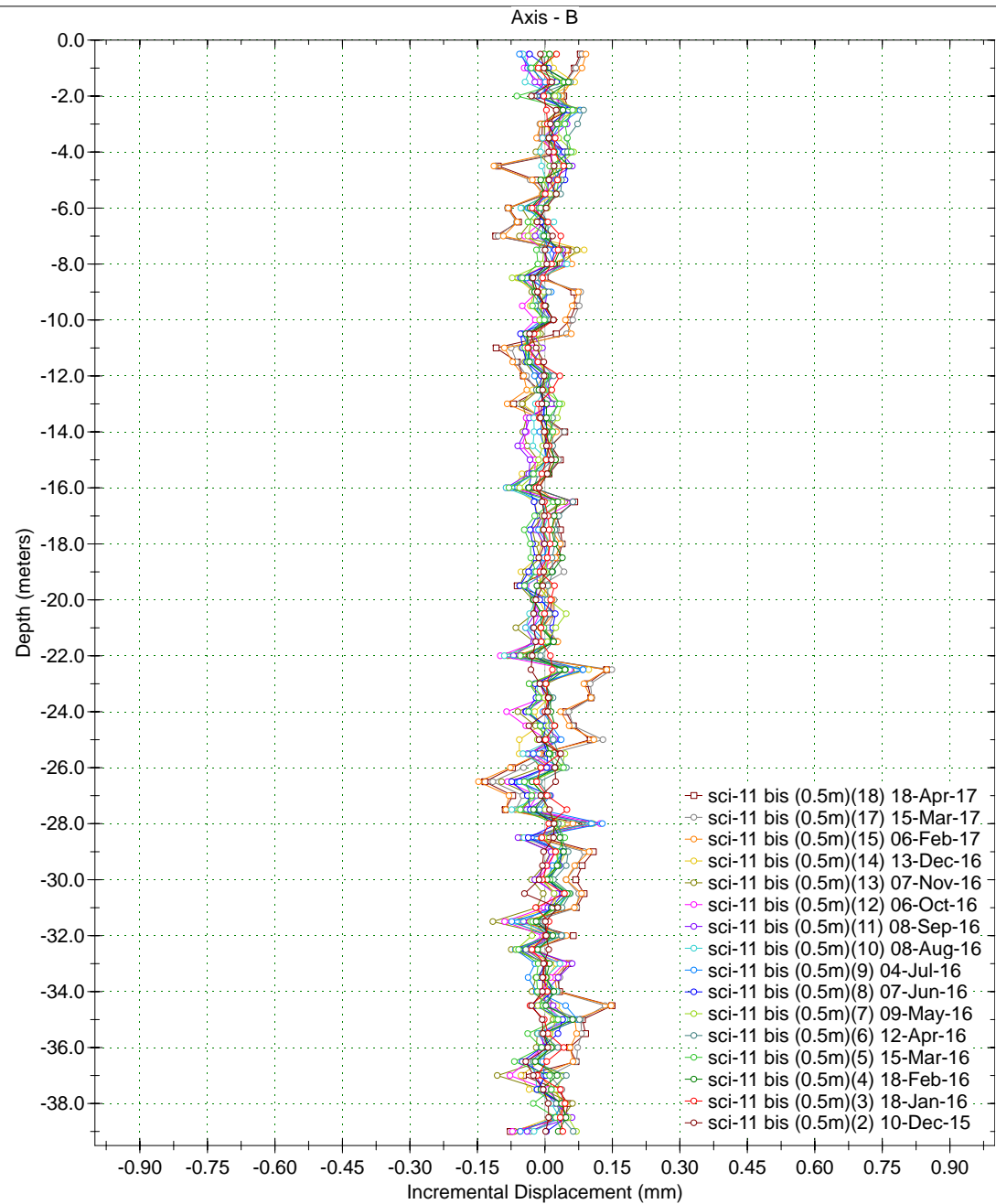
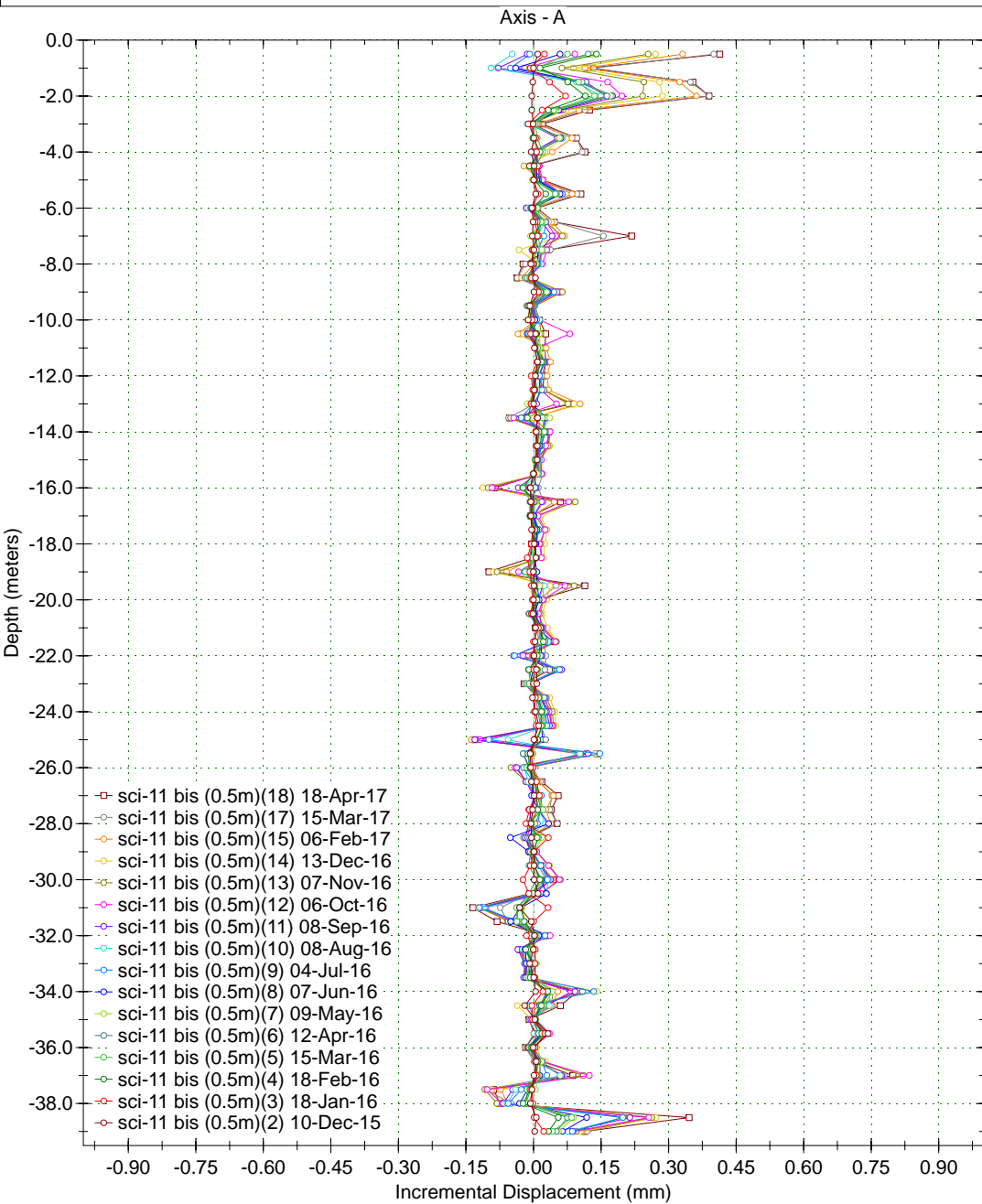
Borehole : sci-7 bis (50m)
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 50.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Apr 10 16:52
Applied Azimuth : 0.0 degrees



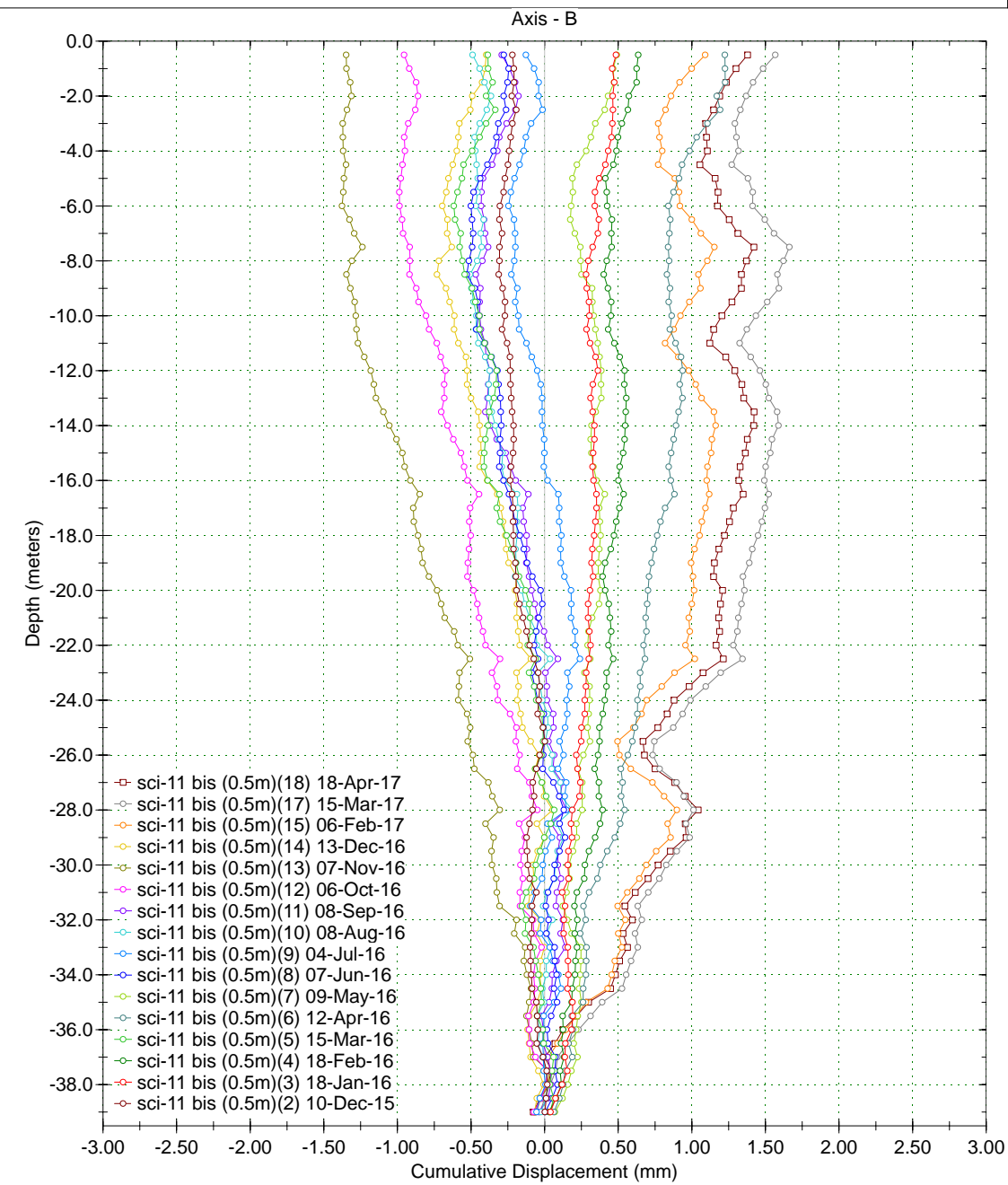
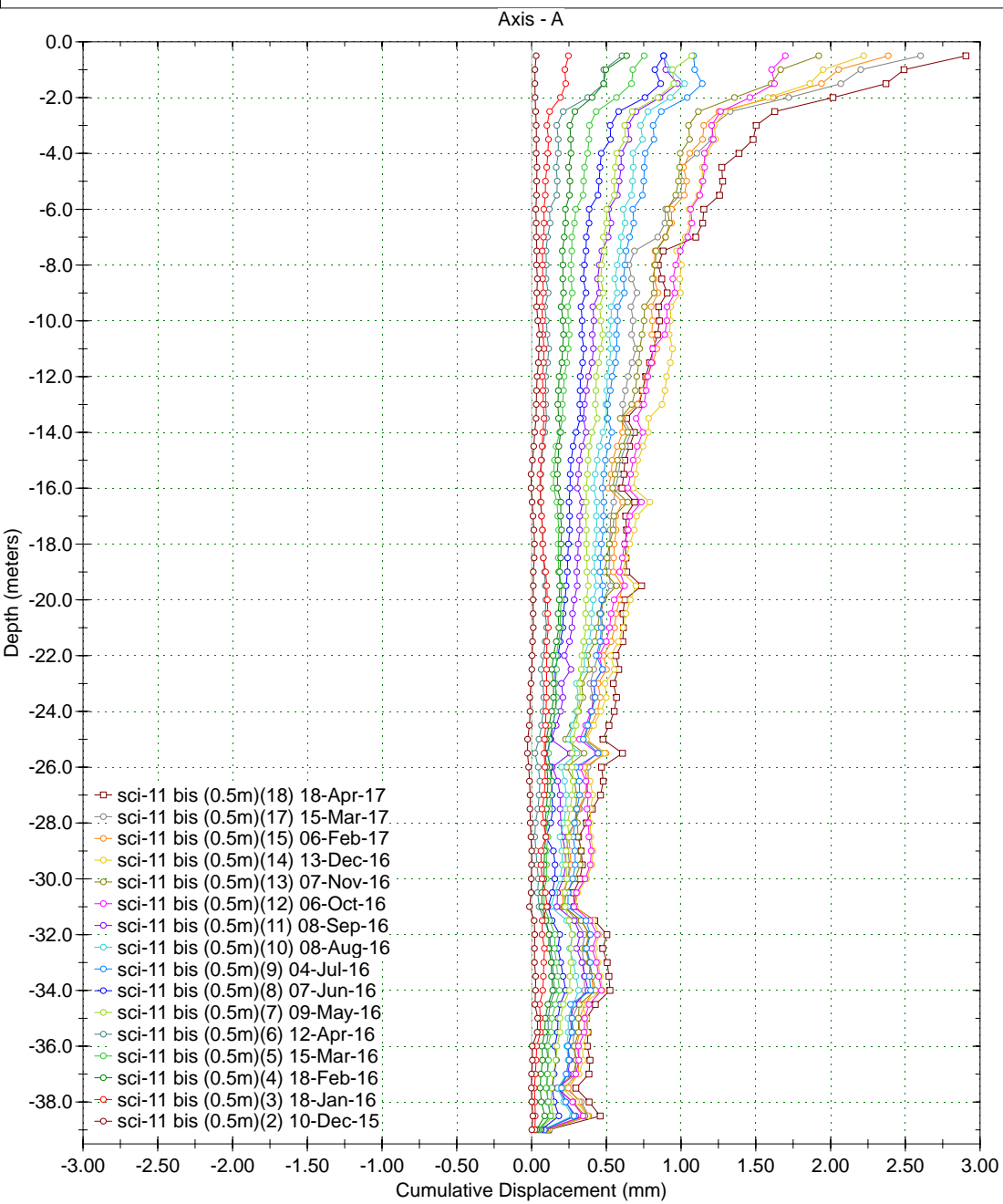
Borehole : sci-11 bis
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 39.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Dec 10 10:02
 Applied Azimuth : 0.0 degrees



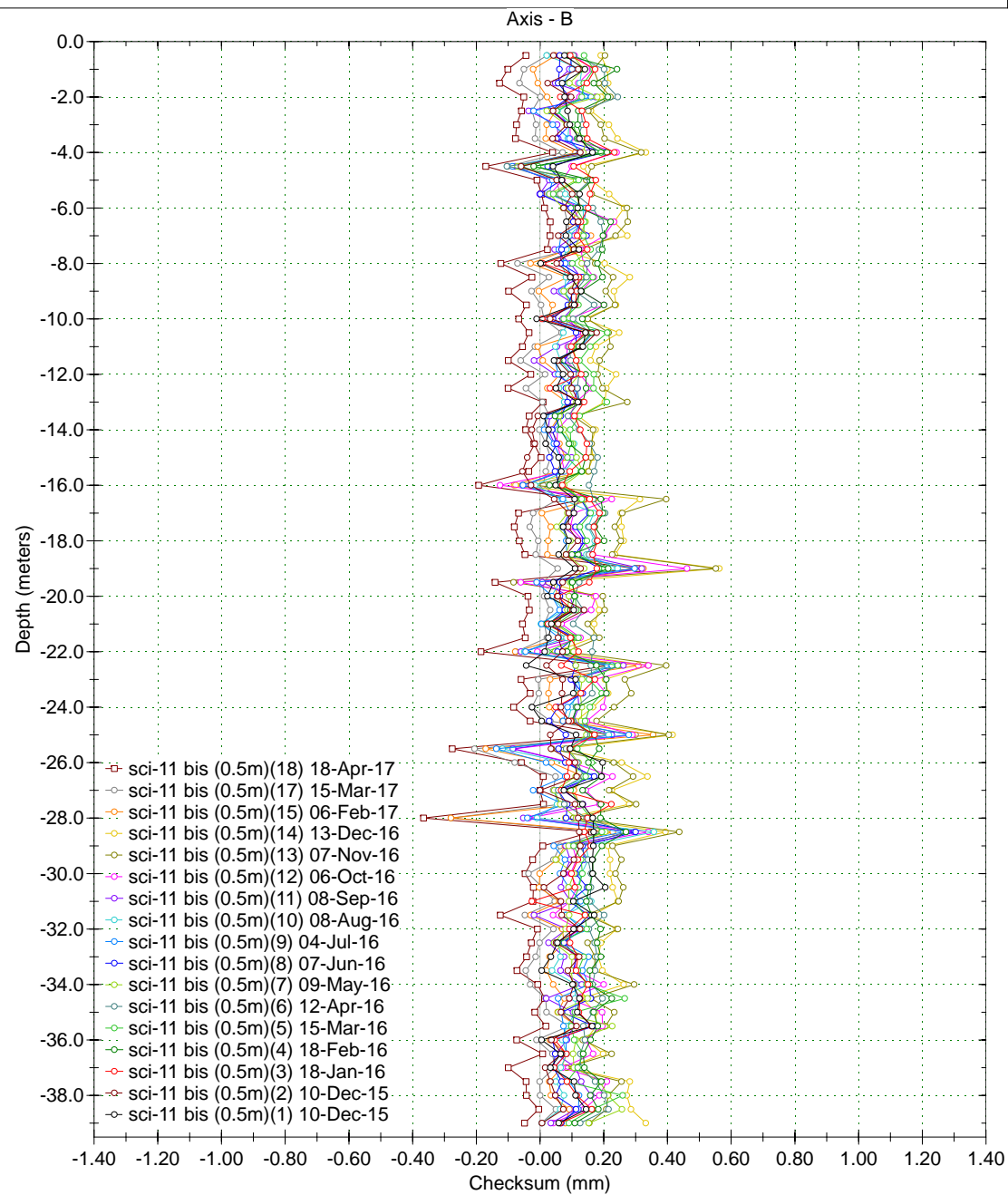
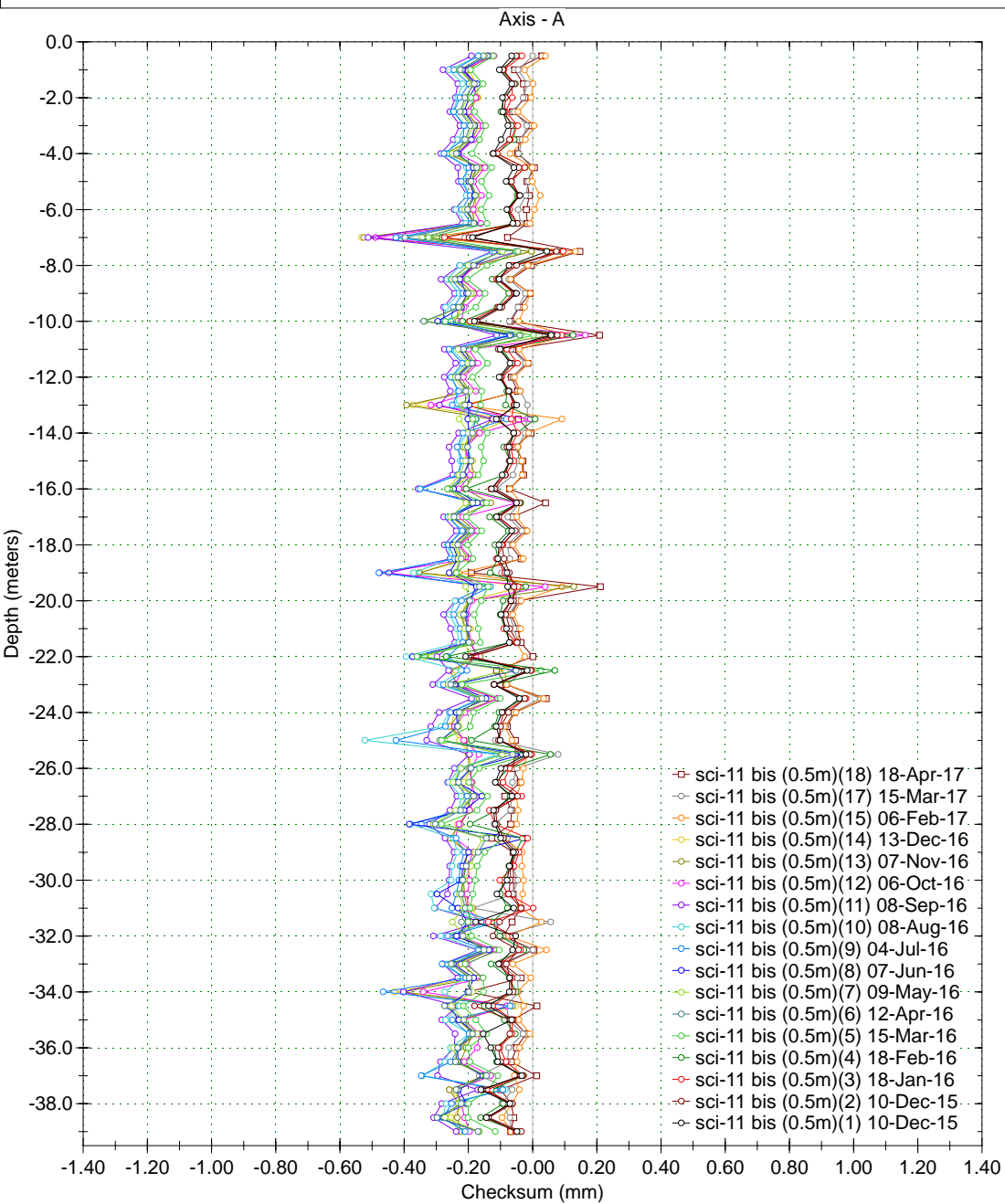
Borehole : sci-11 bis
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 39.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Dec 10 10:02
 Applied Azimuth : 0.0 degrees



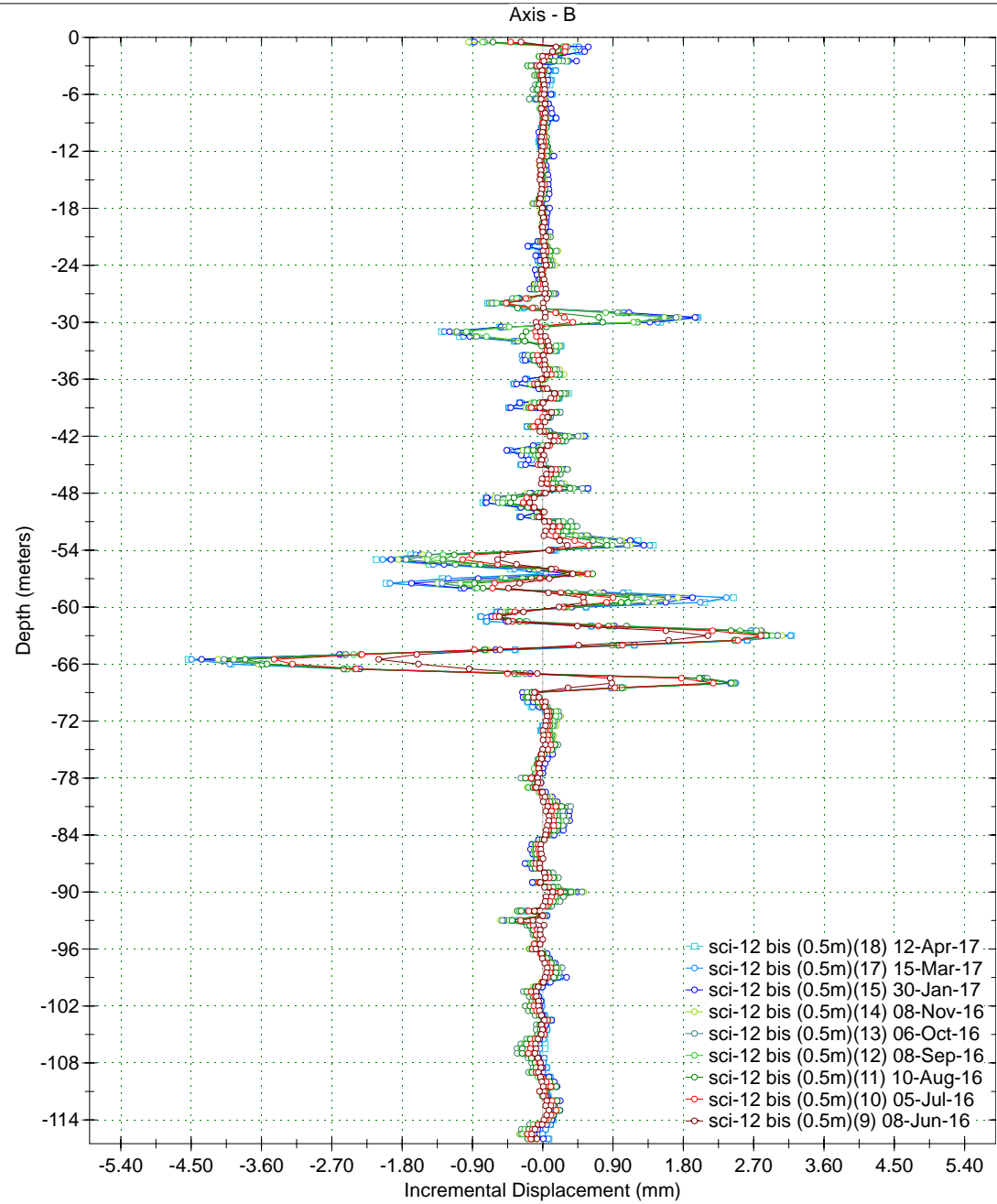
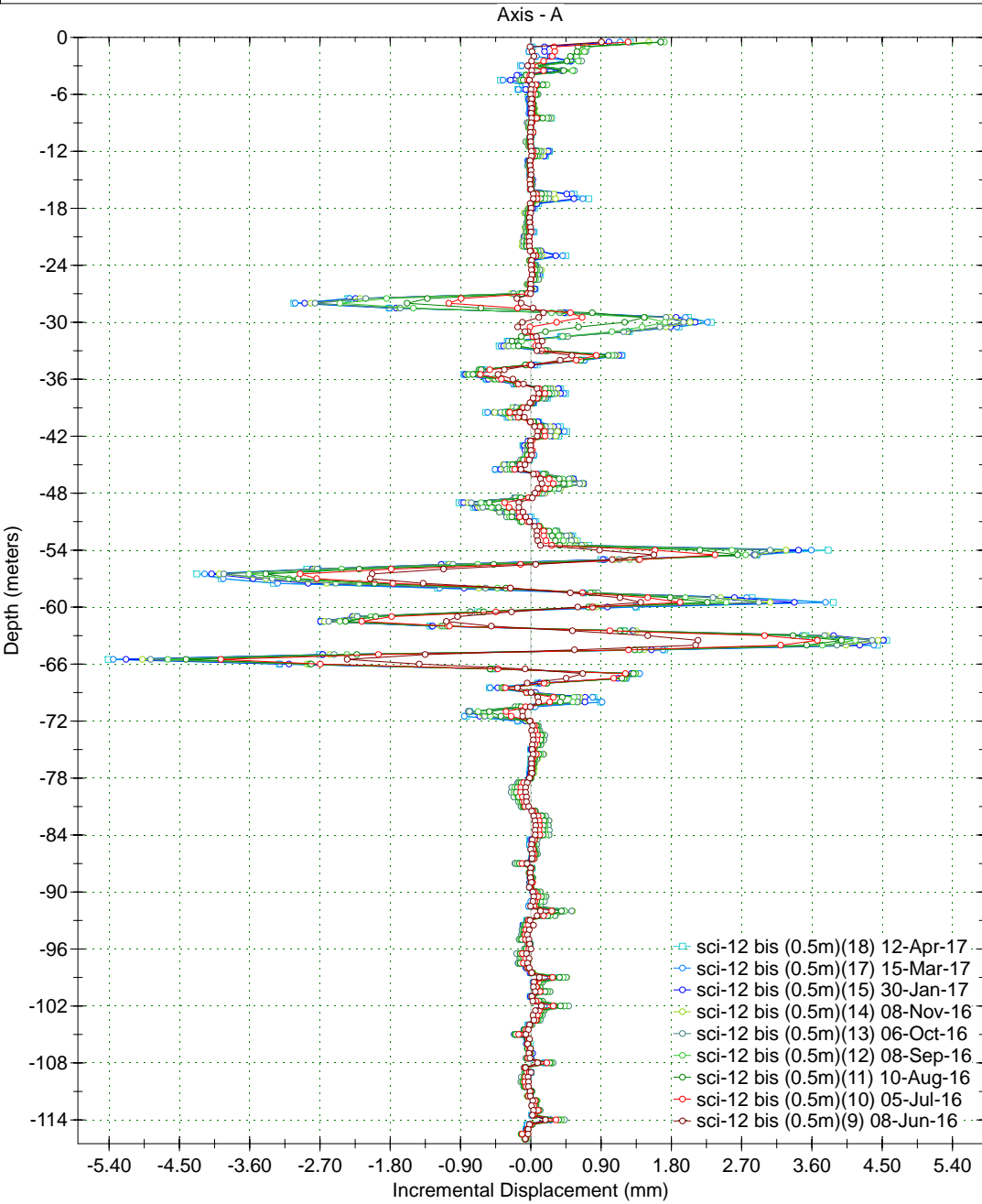
Borehole : sci-11 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 39.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Dec 10 10:02
Applied Azimuth : 0.0 degrees



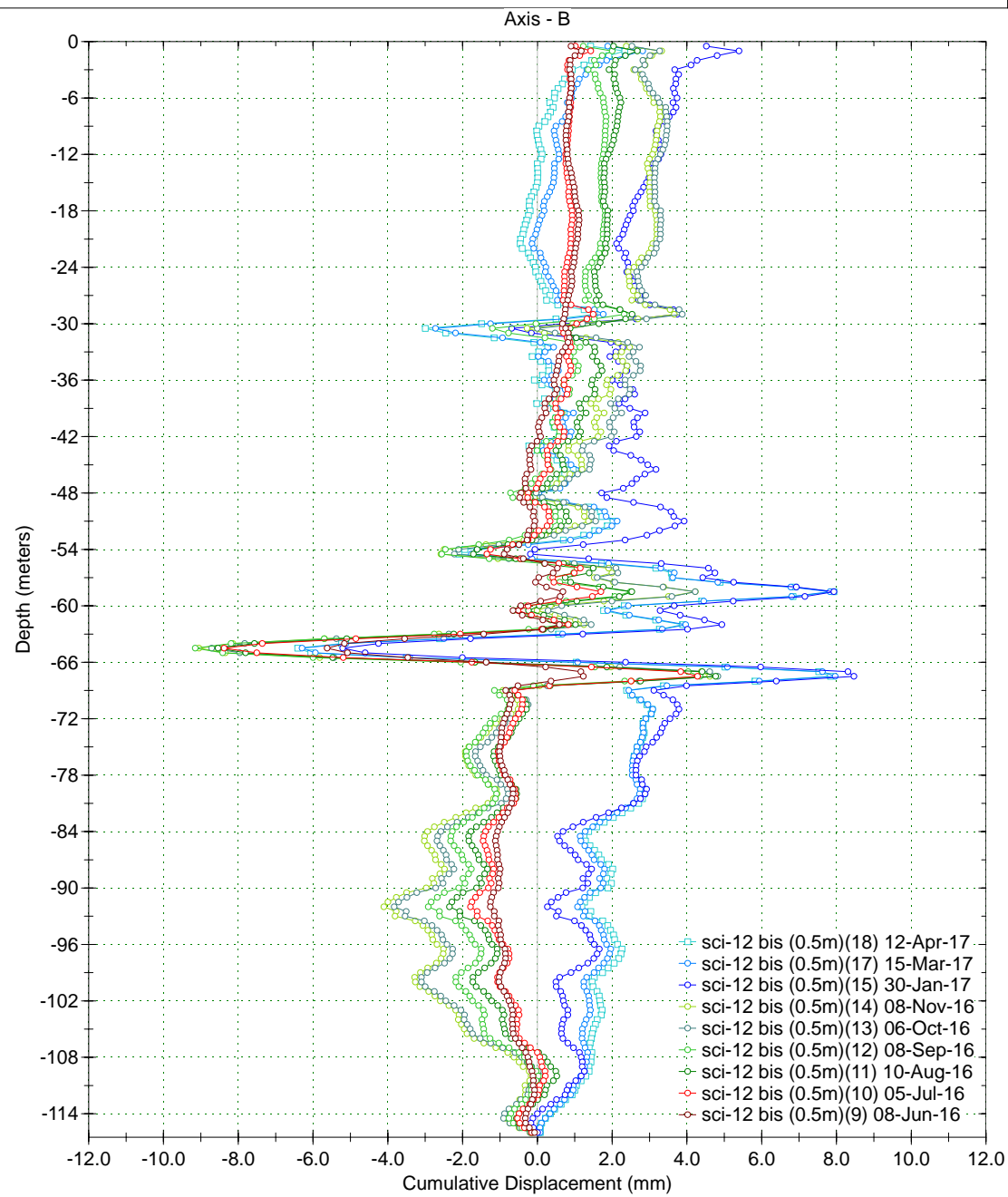
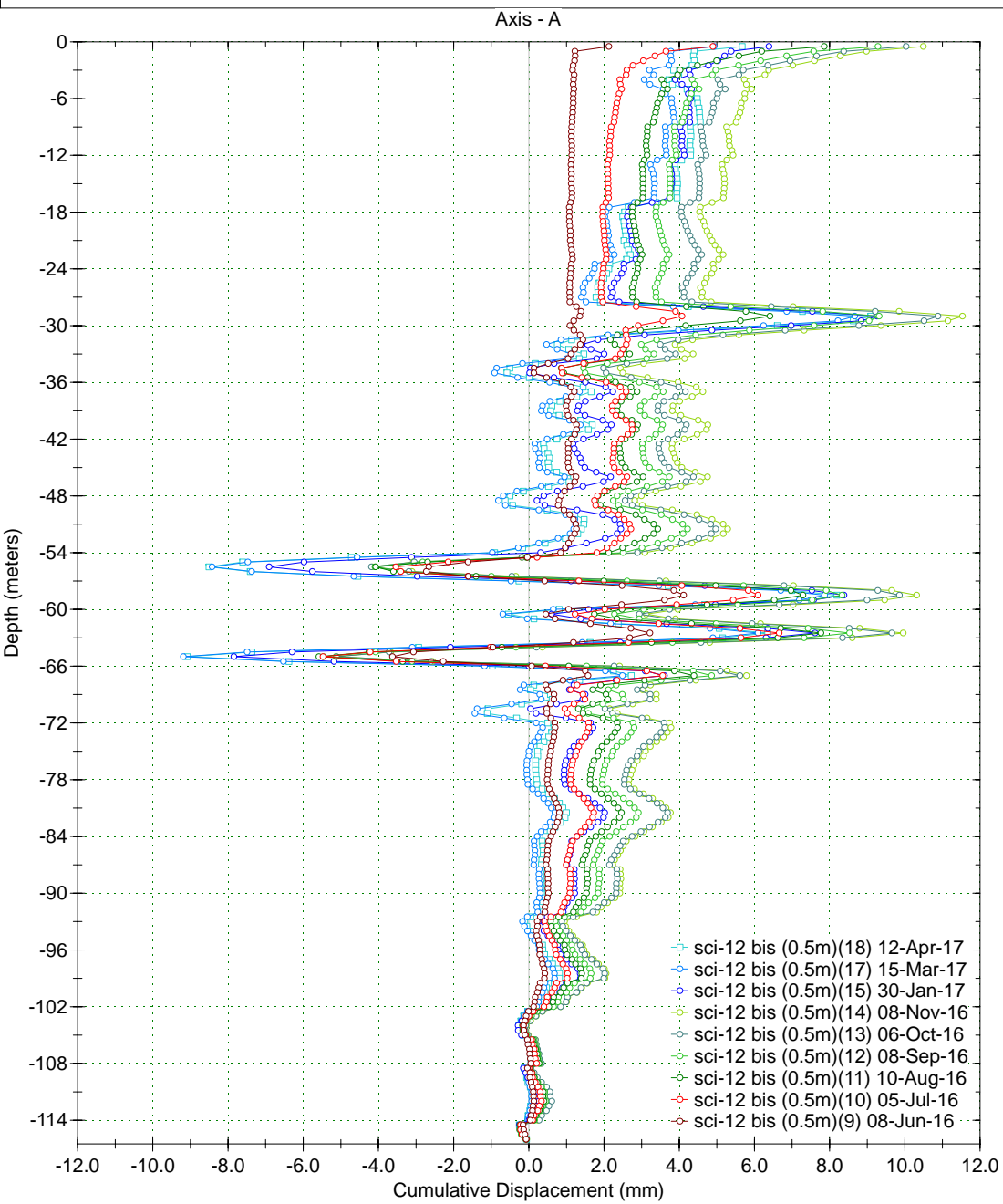
Borehole : sci-12 bis
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 116.0 meters
 A+ Groove Azimuth :
 Base Reading : 2016 May 10 12:38
 Applied Azimuth : 0.0 degrees



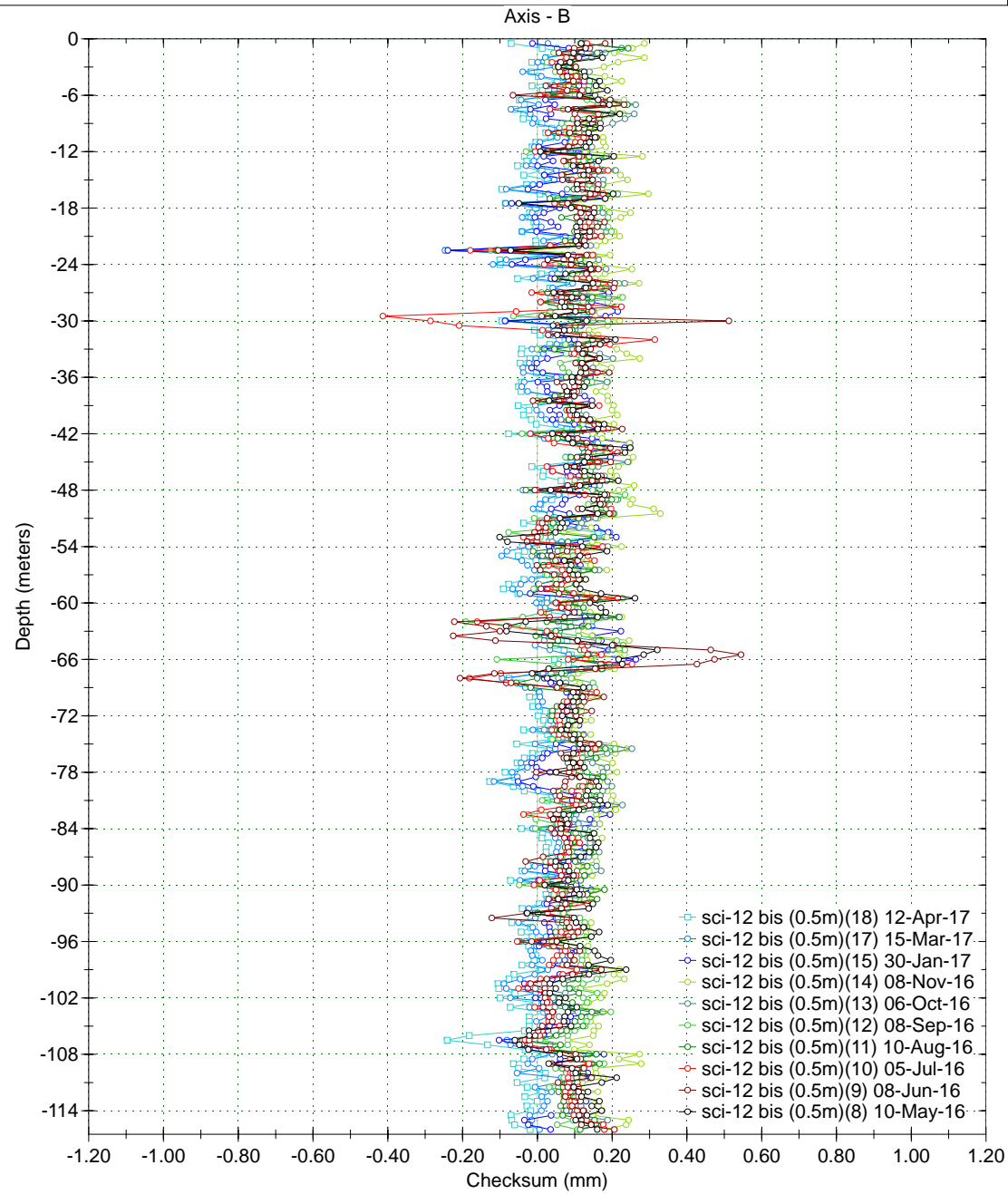
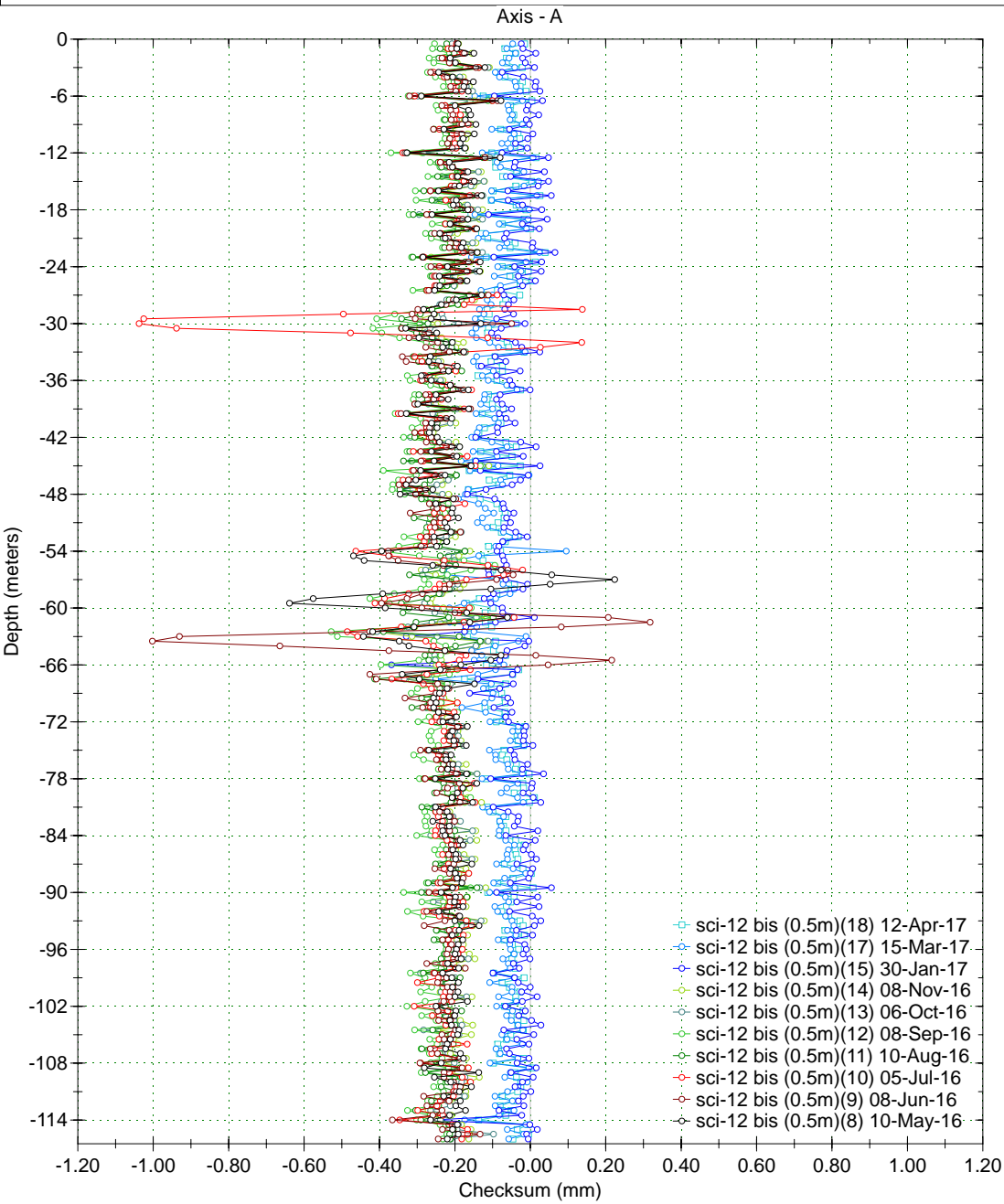
Borehole : sci-12 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 116.0 meters
A+ Groove Azimuth :
Base Reading : 2016 May 10 12:38
Applied Azimuth : 0.0 degrees



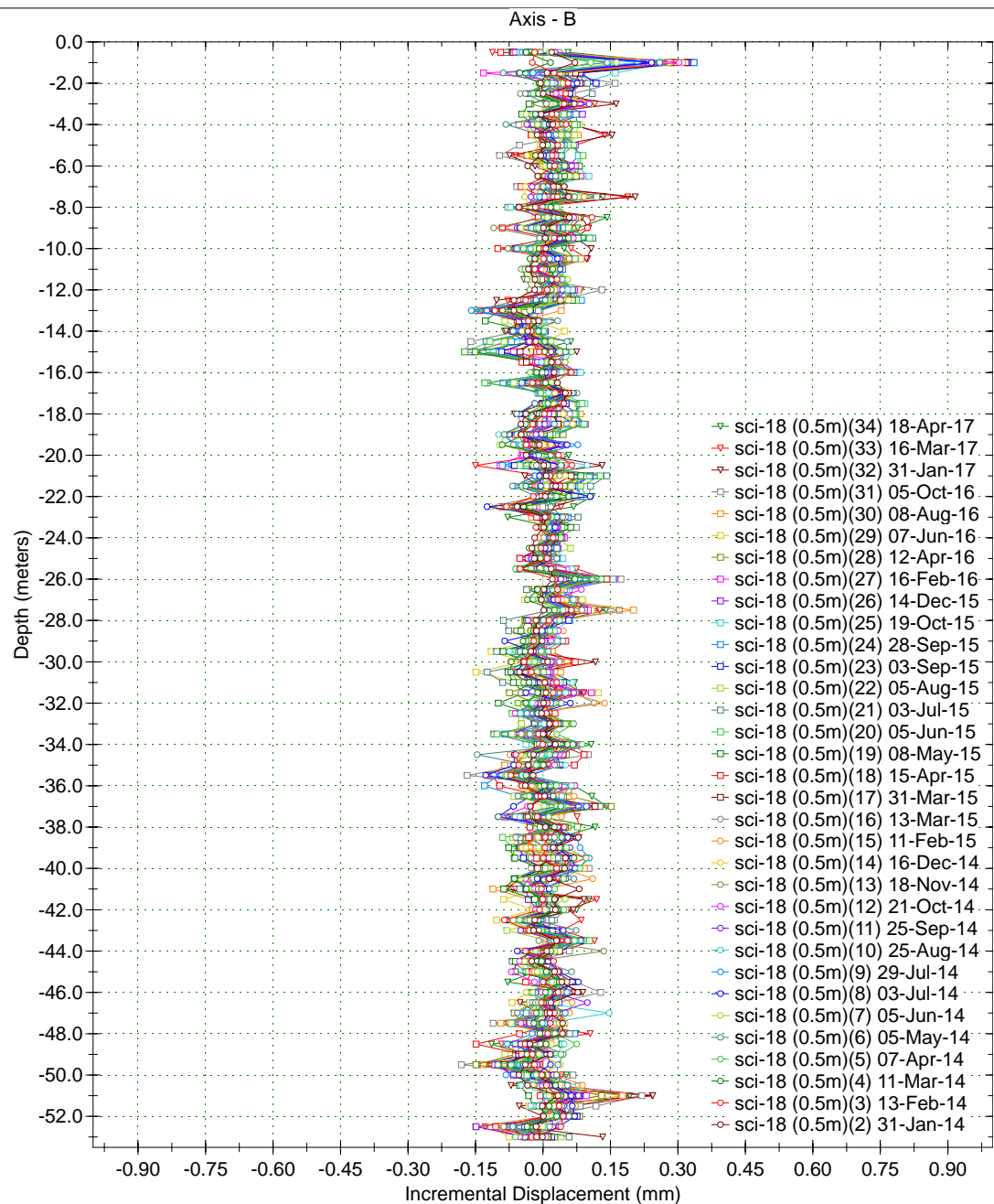
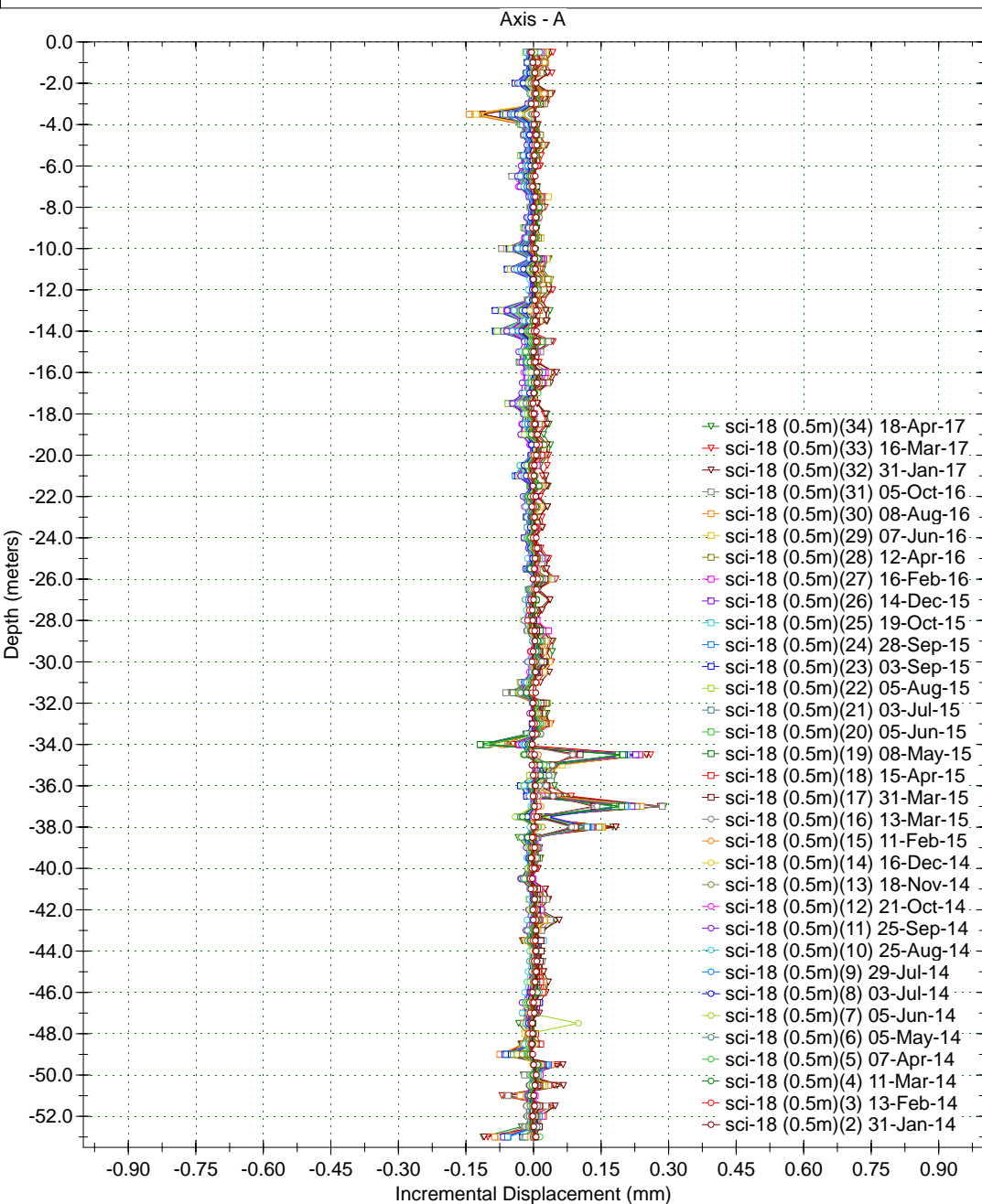
Borehole : sci-12 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 116.0 meters
A+ Groove Azimuth :
Base Reading : 2016 May 10 12:38
Applied Azimuth : 0.0 degrees



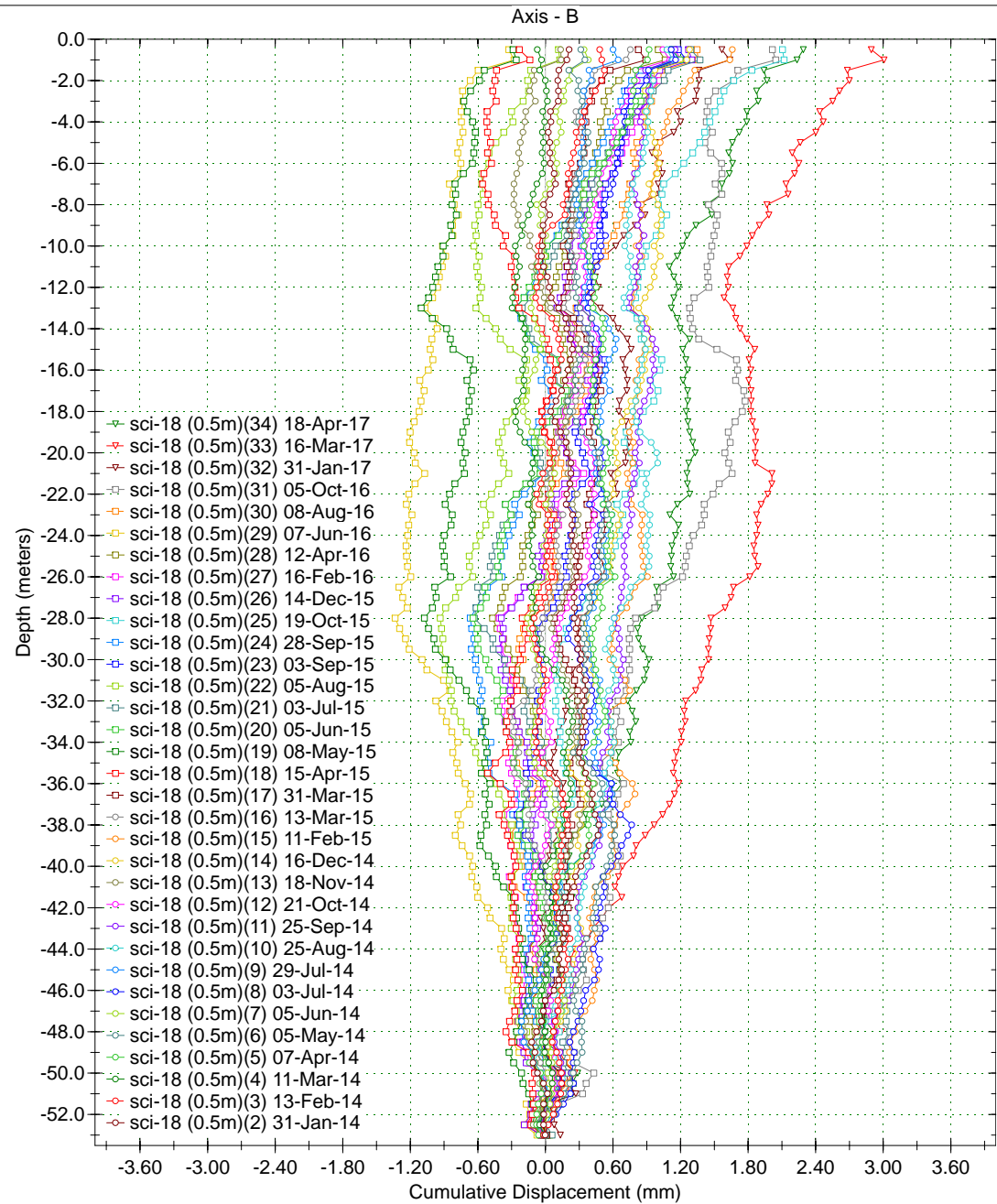
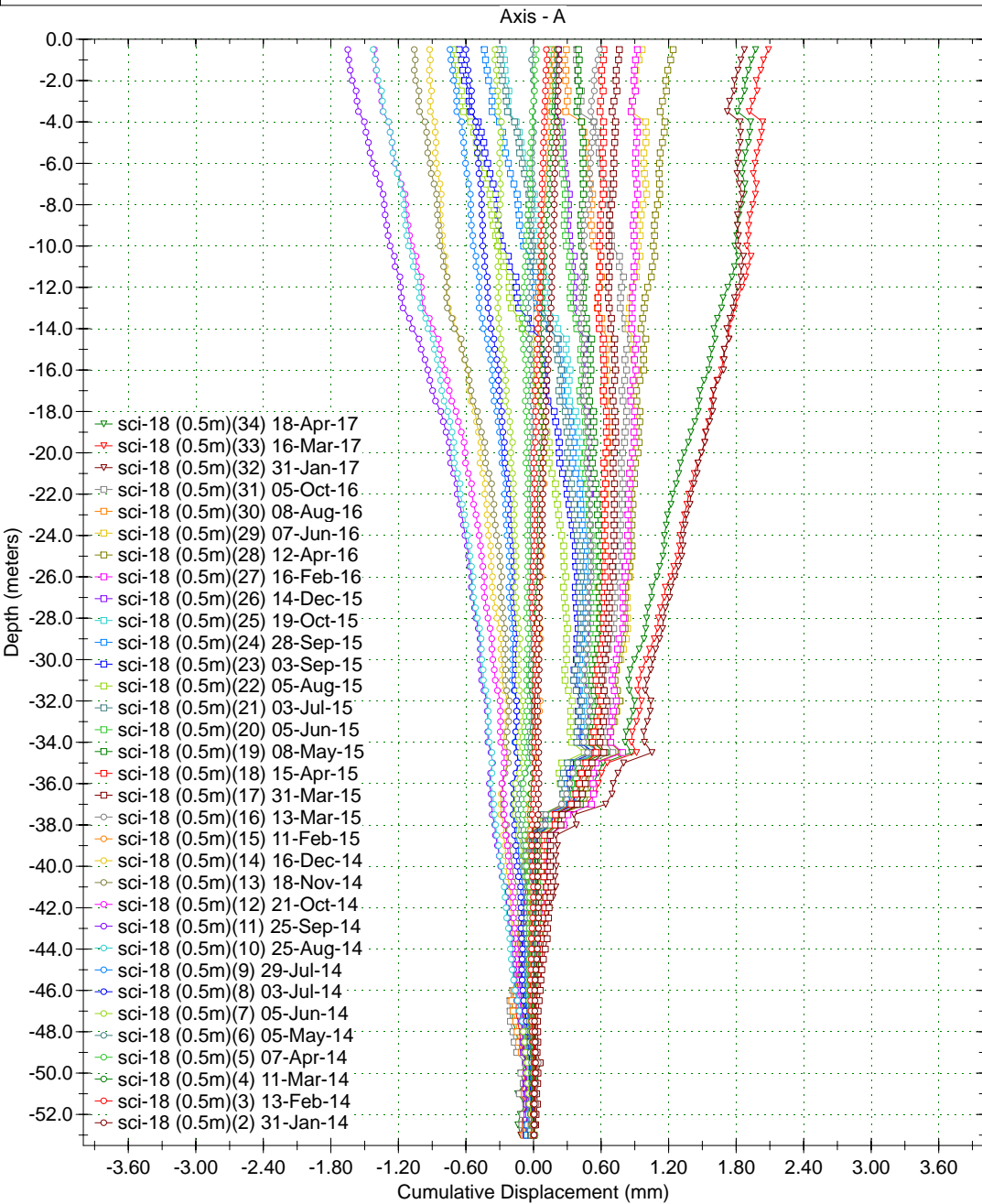
Borehole : sci-18
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 53.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 31 10:22
Applied Azimuth : 0.0 degrees



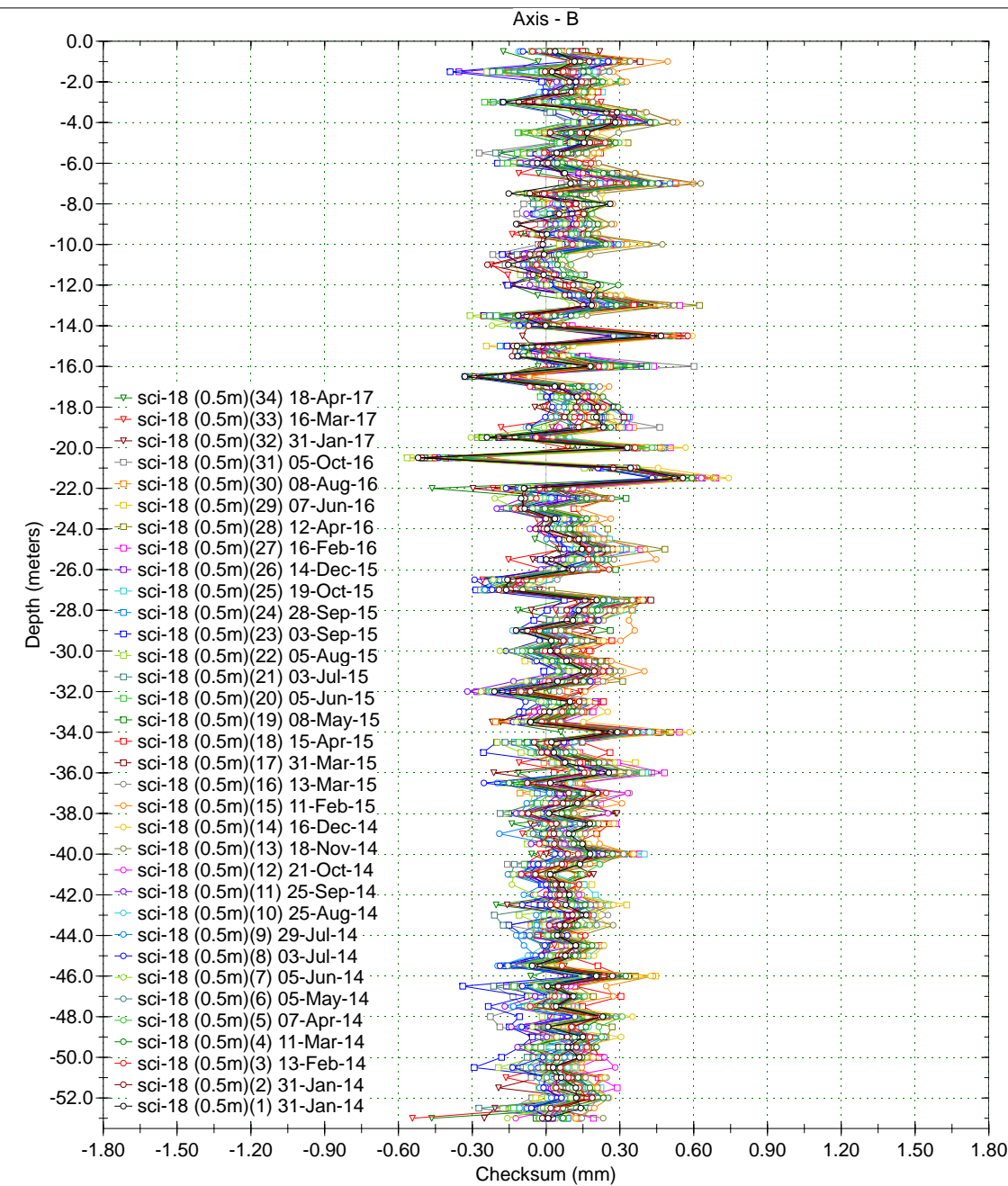
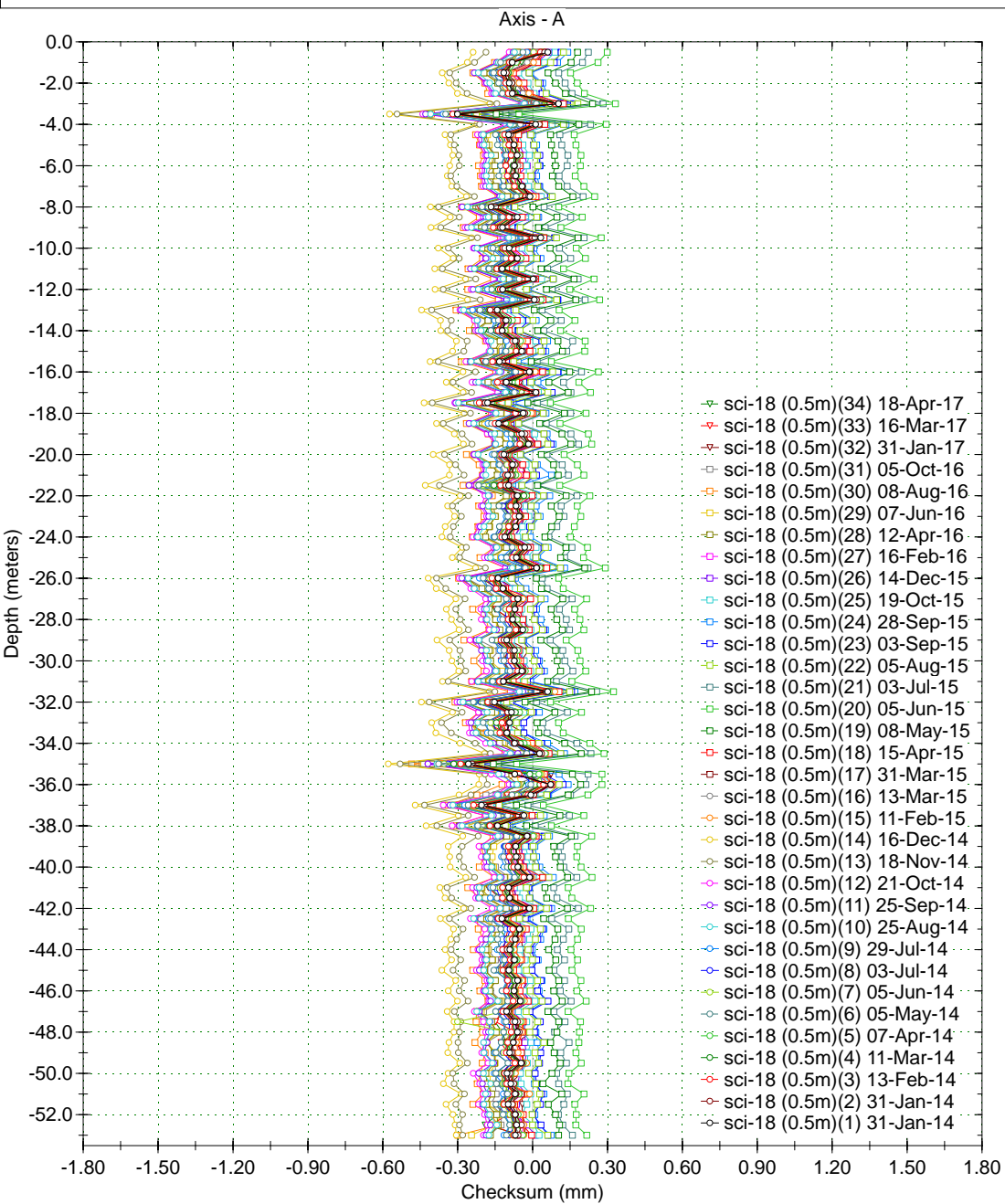
Borehole : sci-18
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 53.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jan 31 10:22
 Applied Azimuth : 0.0 degrees



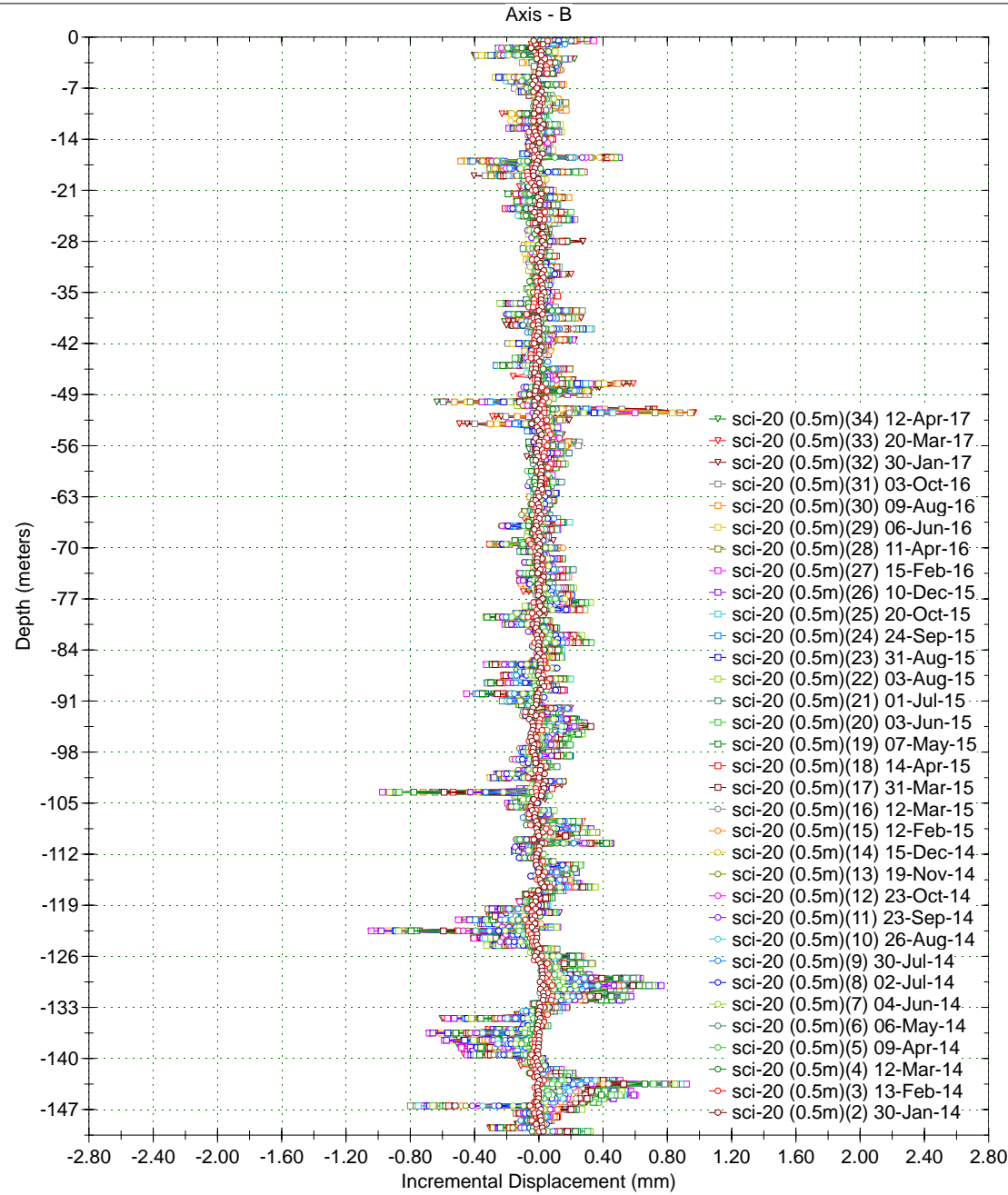
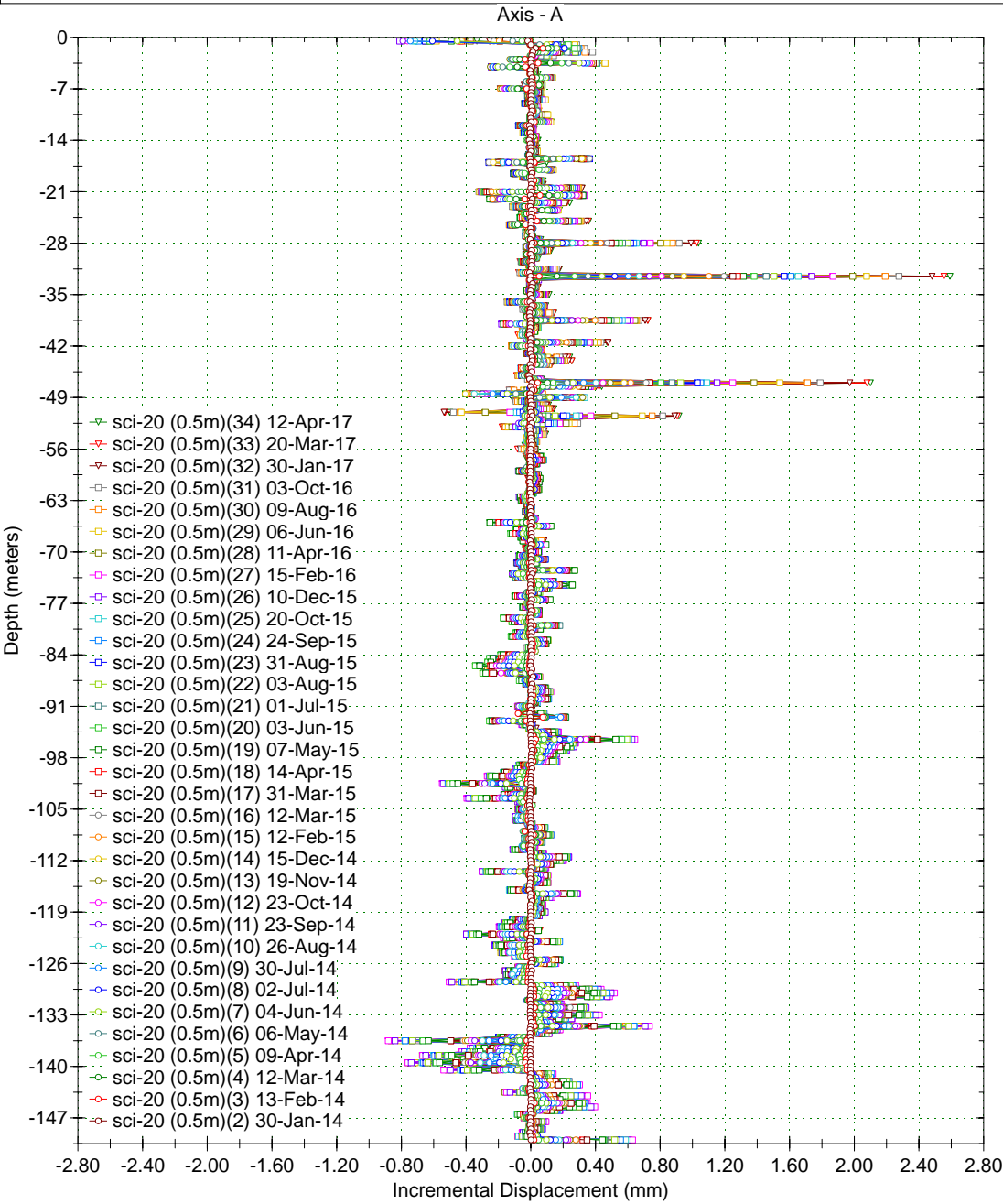
Borehole : sci-18
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 53.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 31 10:22
Applied Azimuth : 0.0 degrees



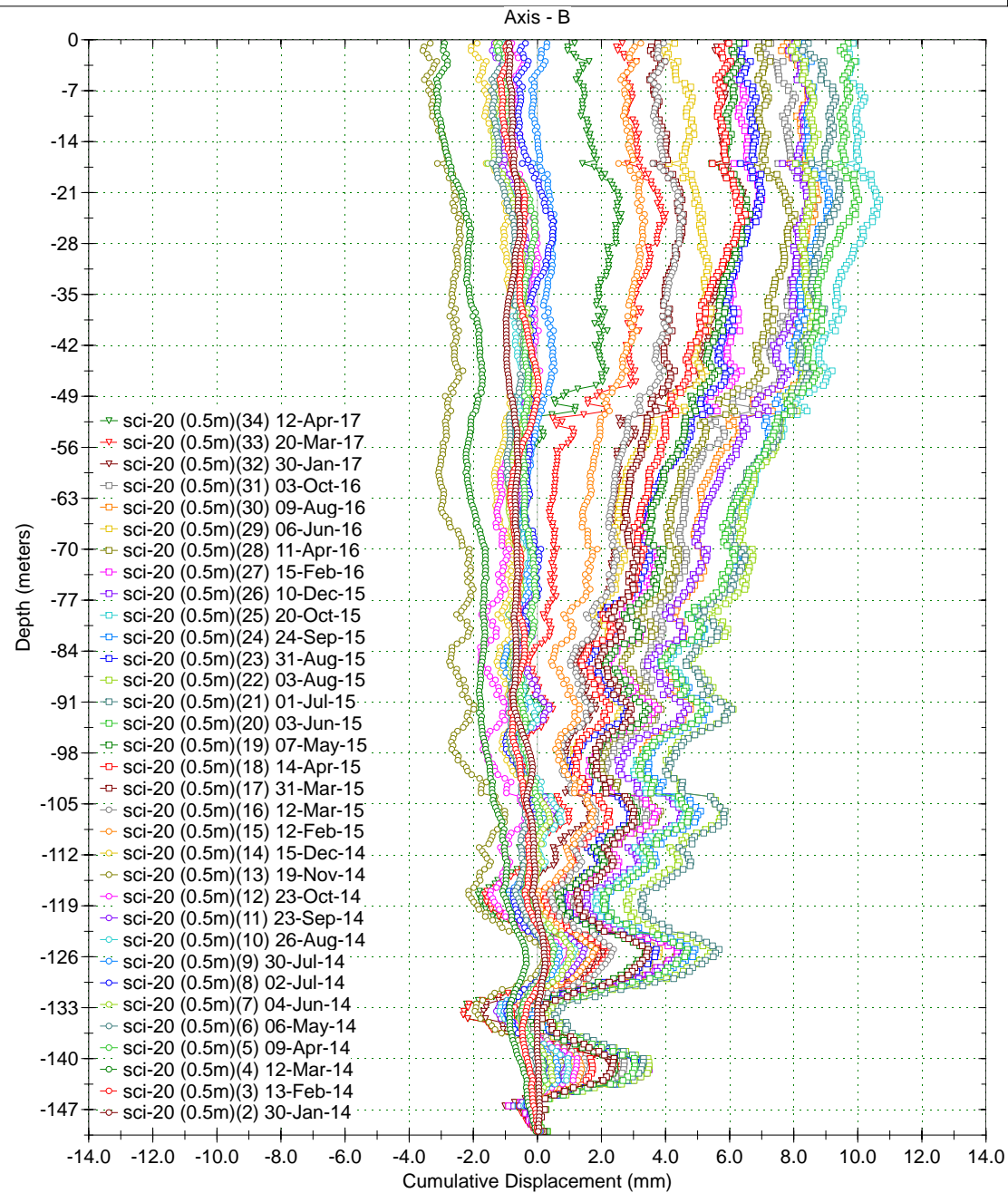
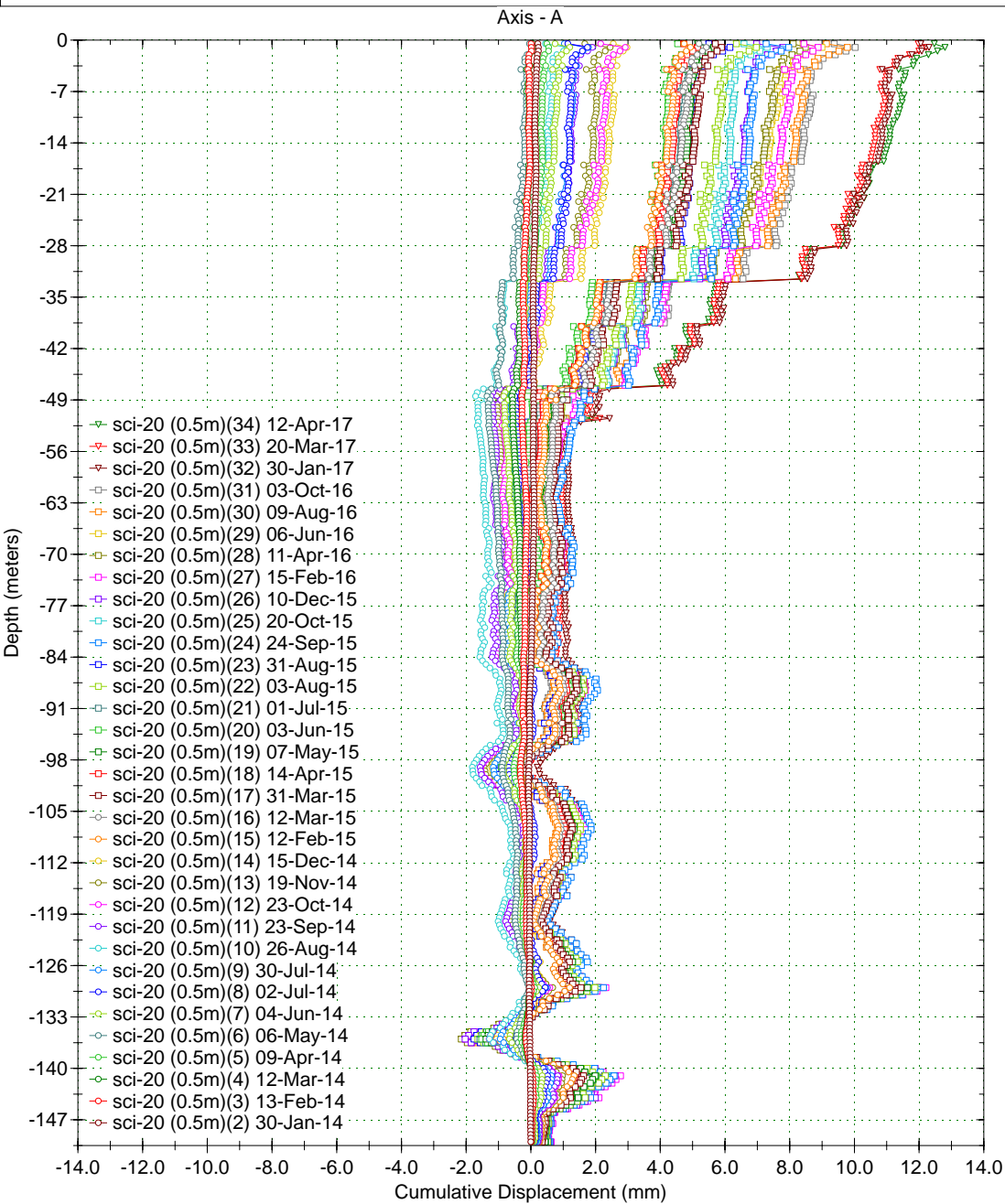
Borehole : sci-20
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 150.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 30 11:35
Applied Azimuth : 0.0 degrees



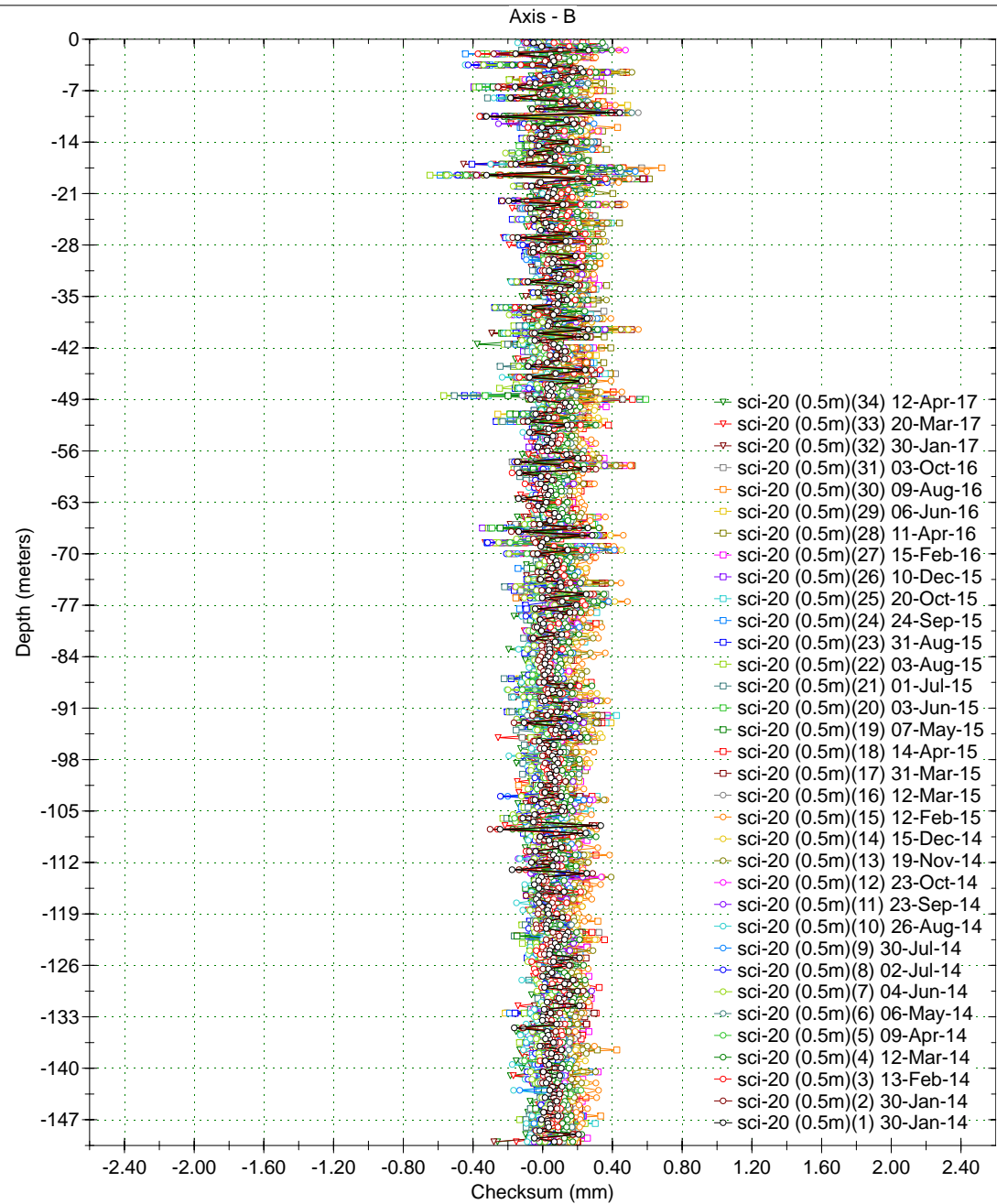
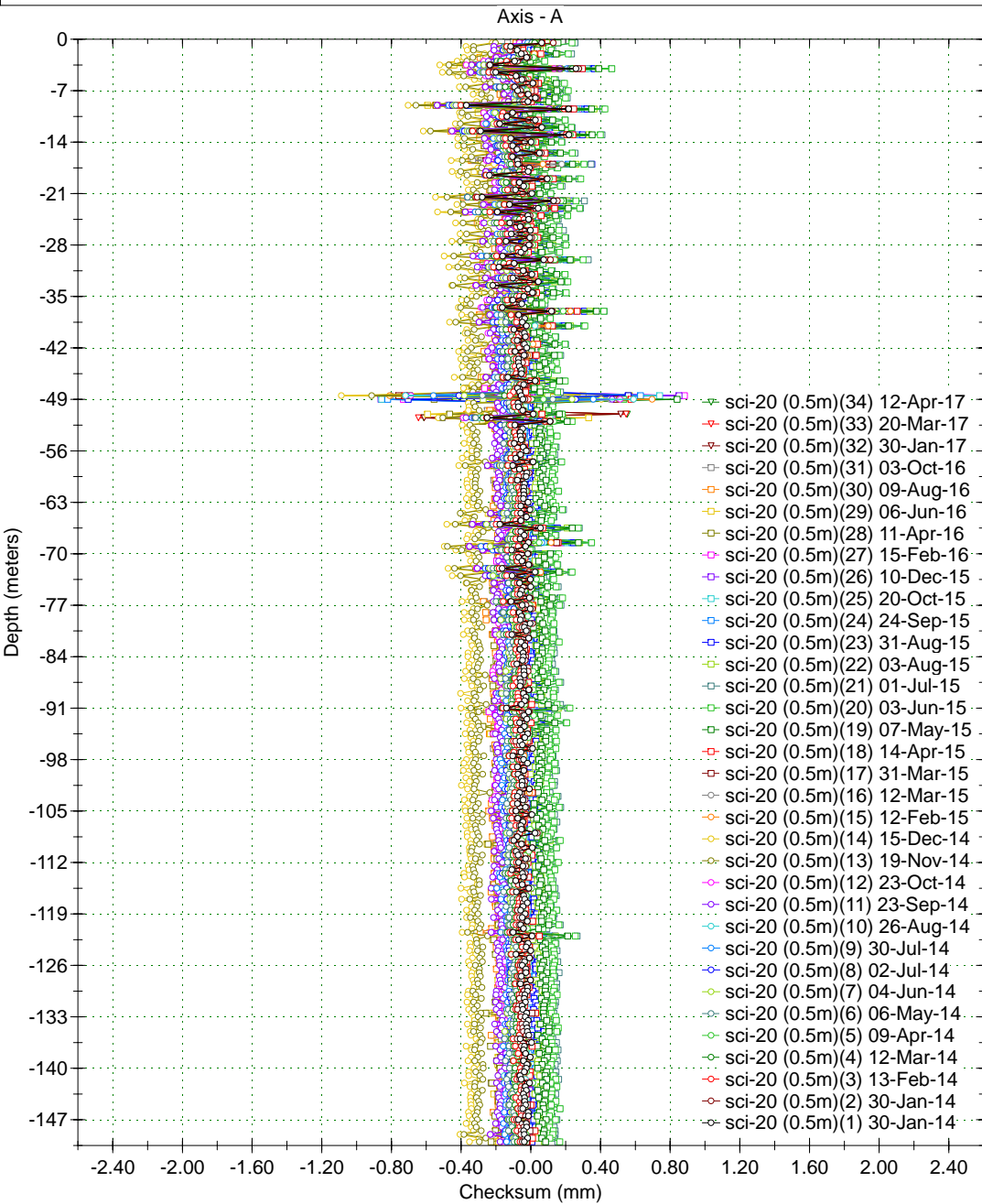
Borehole : sci-20
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 150.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jan 30 11:35
 Applied Azimuth : 0.0 degrees



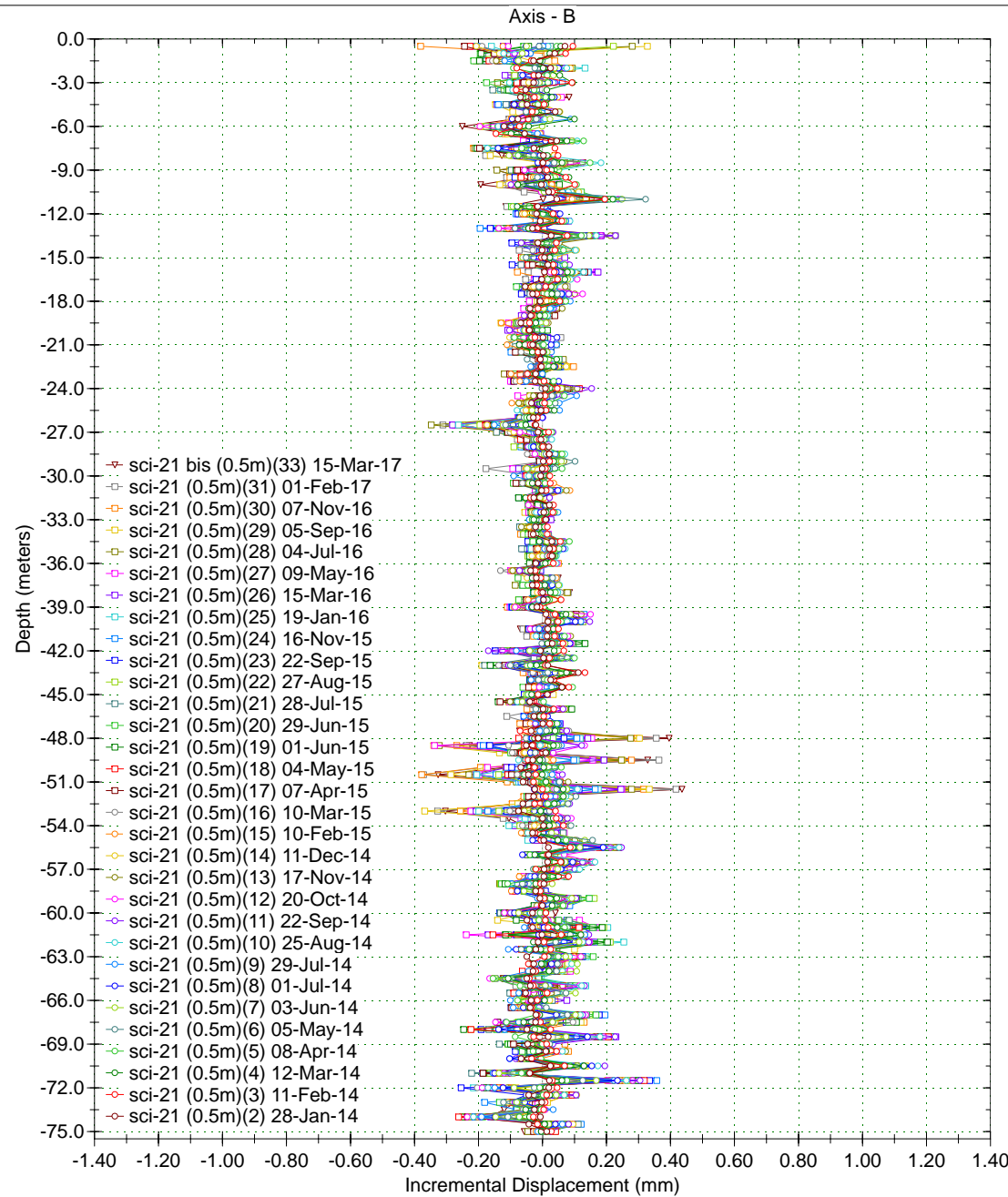
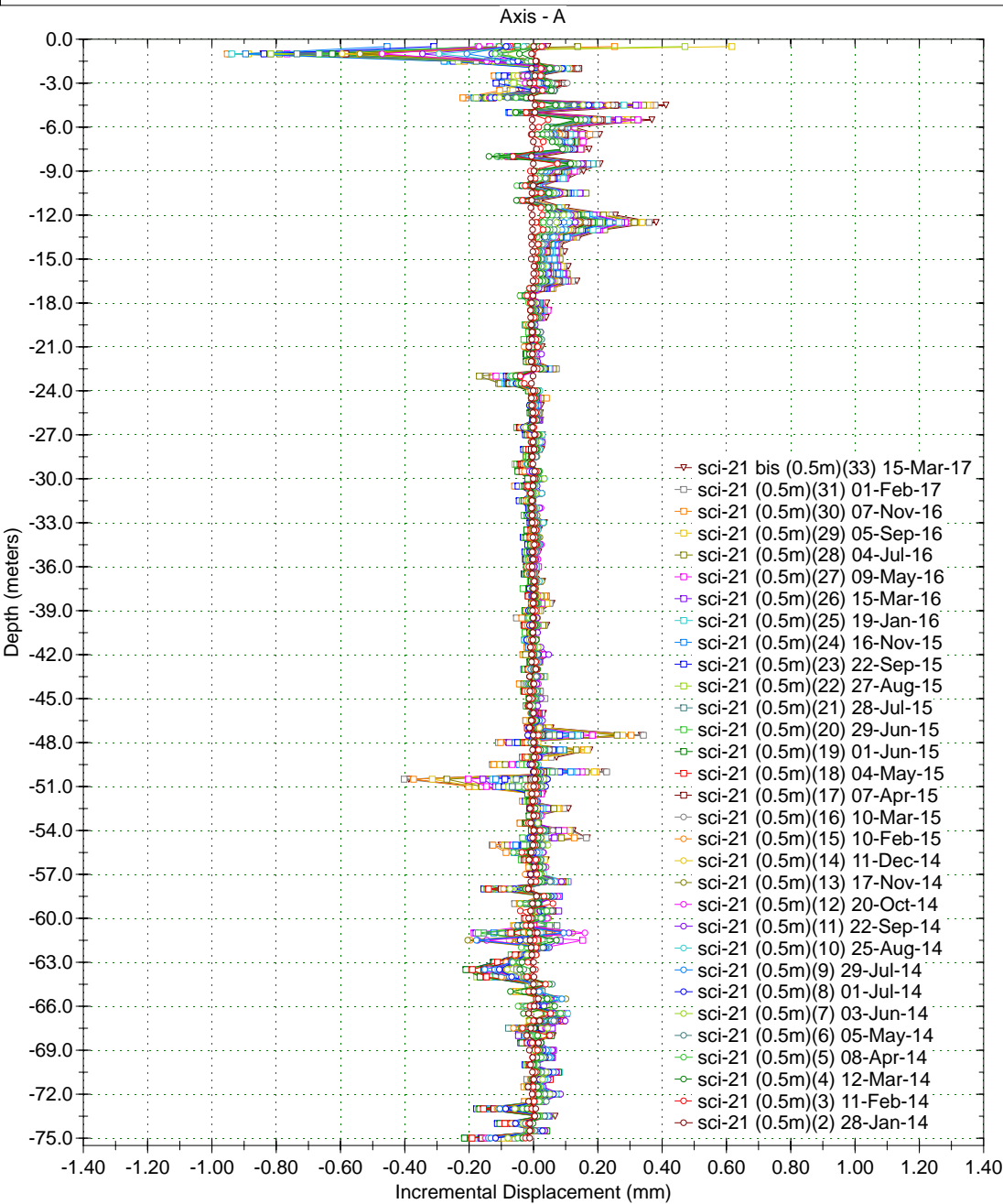
Borehole : sci-20
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 150.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 30 11:35
Applied Azimuth : 0.0 degrees



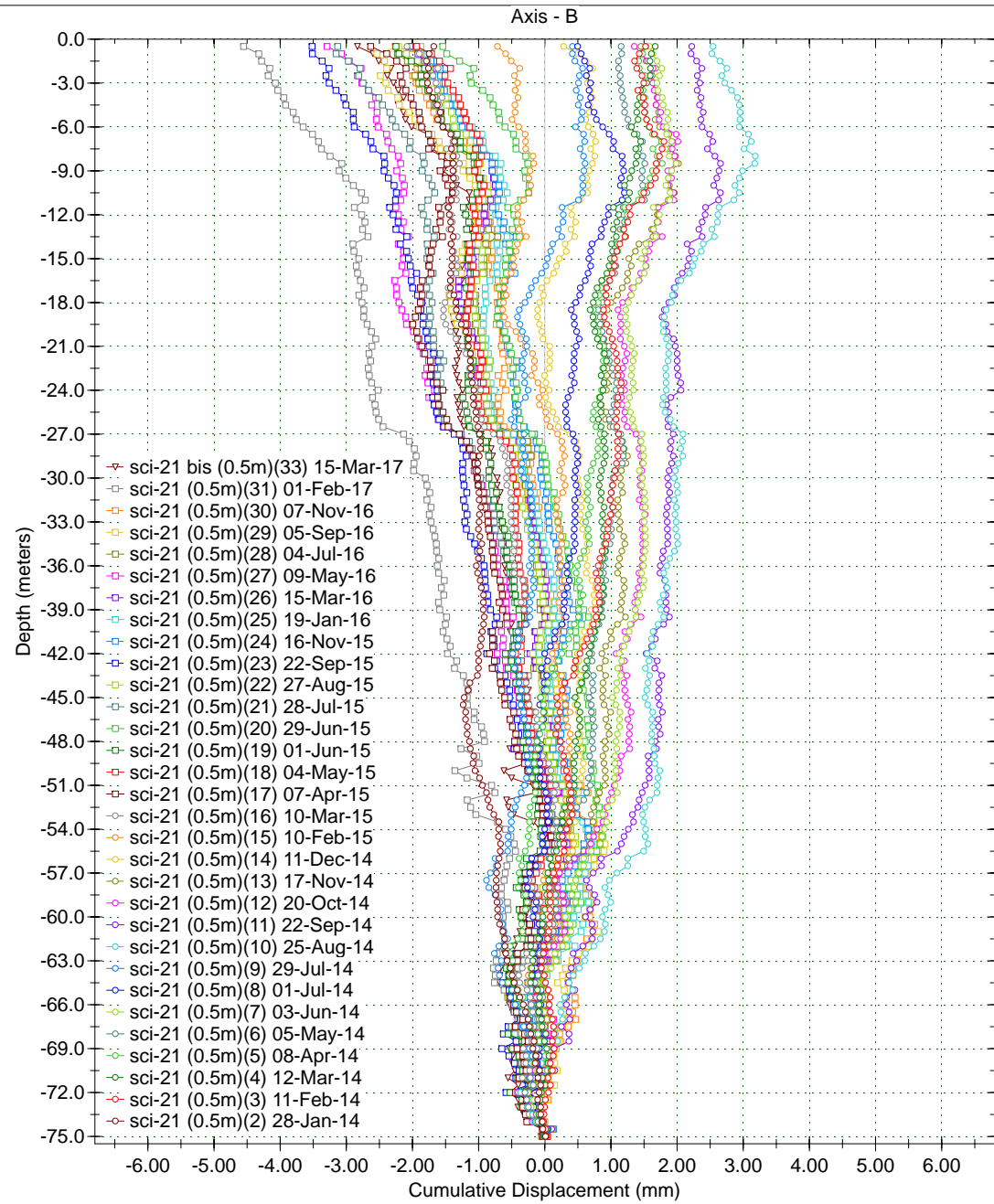
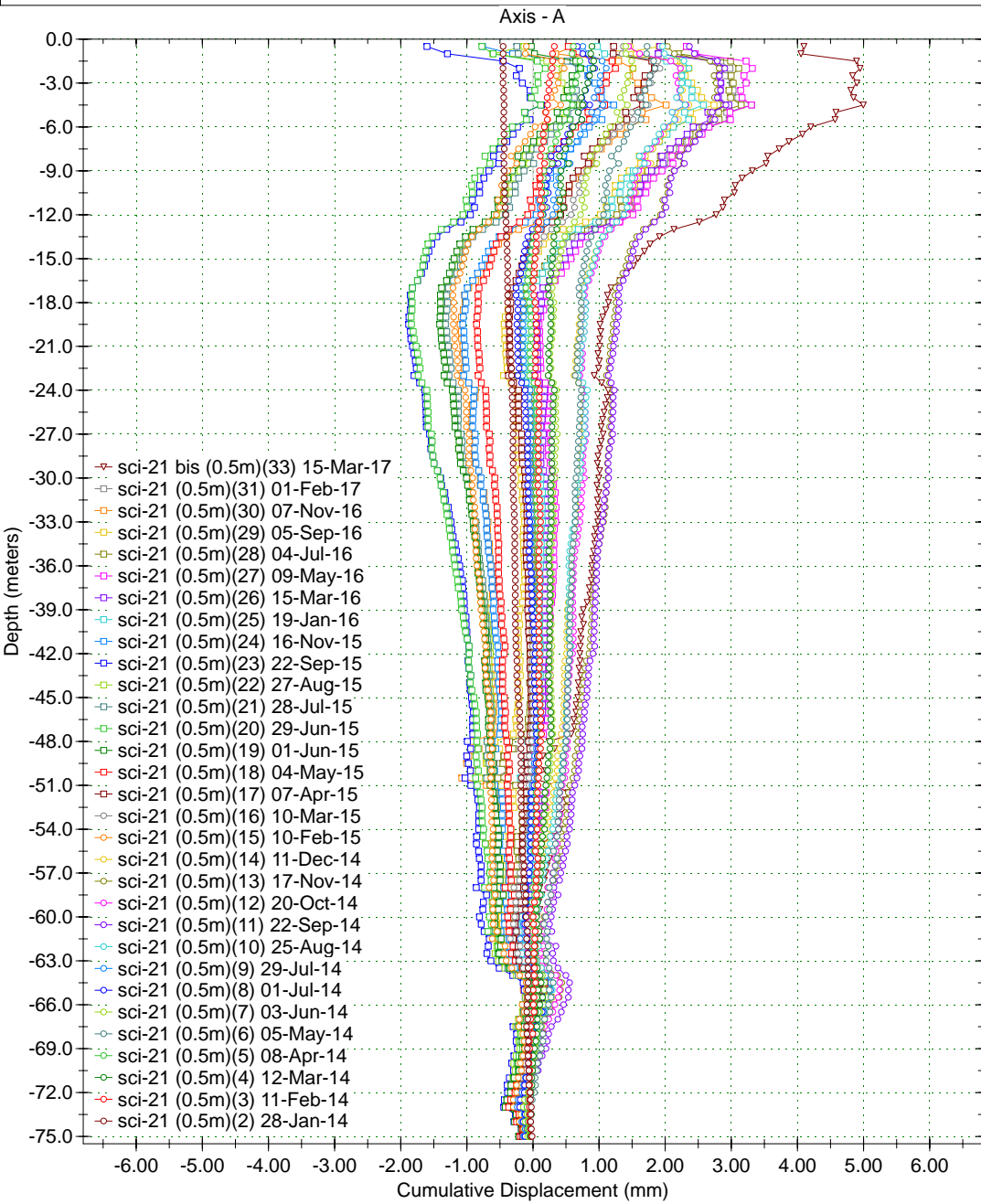
Borehole : sci-21 bis
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 75.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jan 28 11:07
 Applied Azimuth : 0.0 degrees



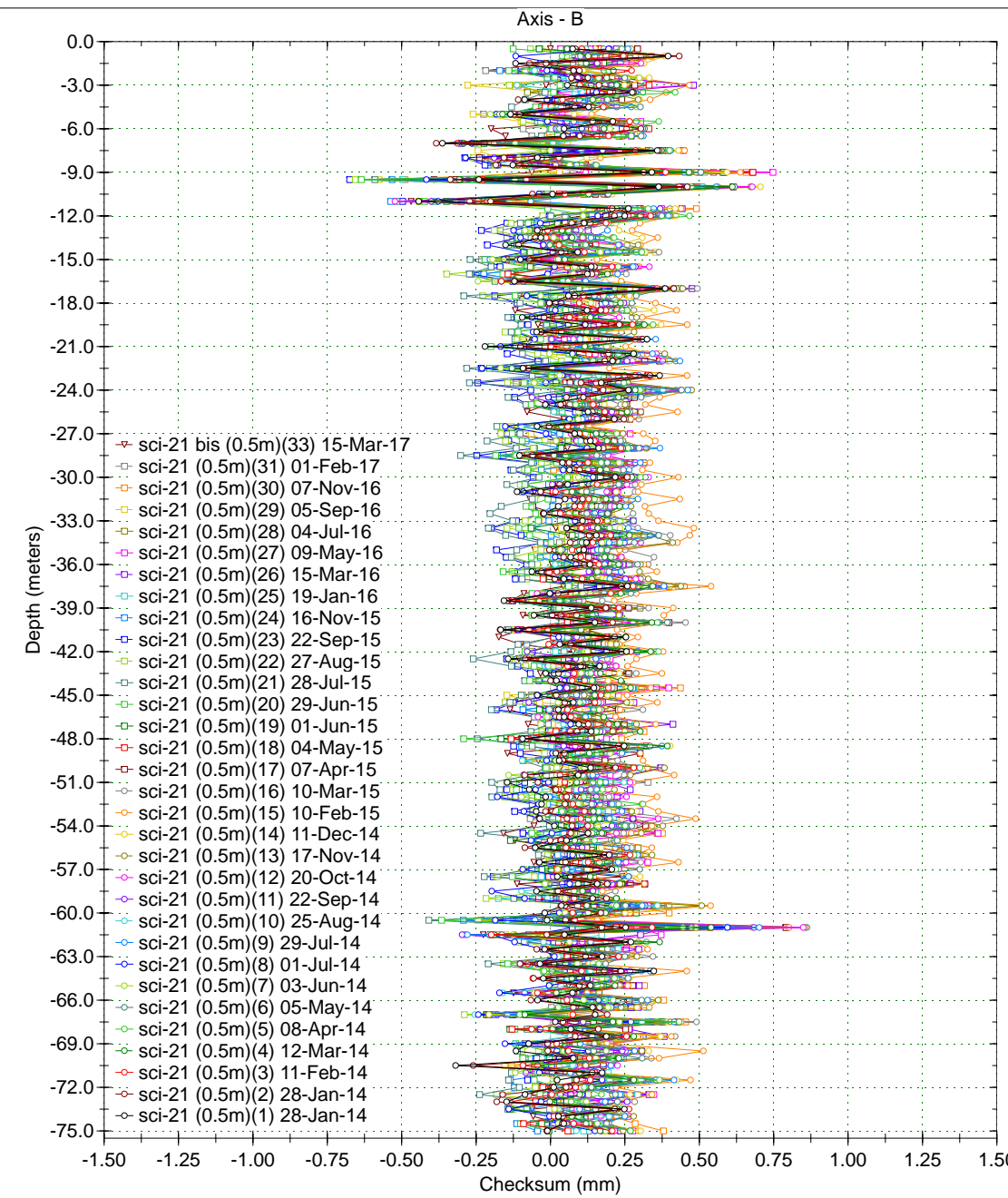
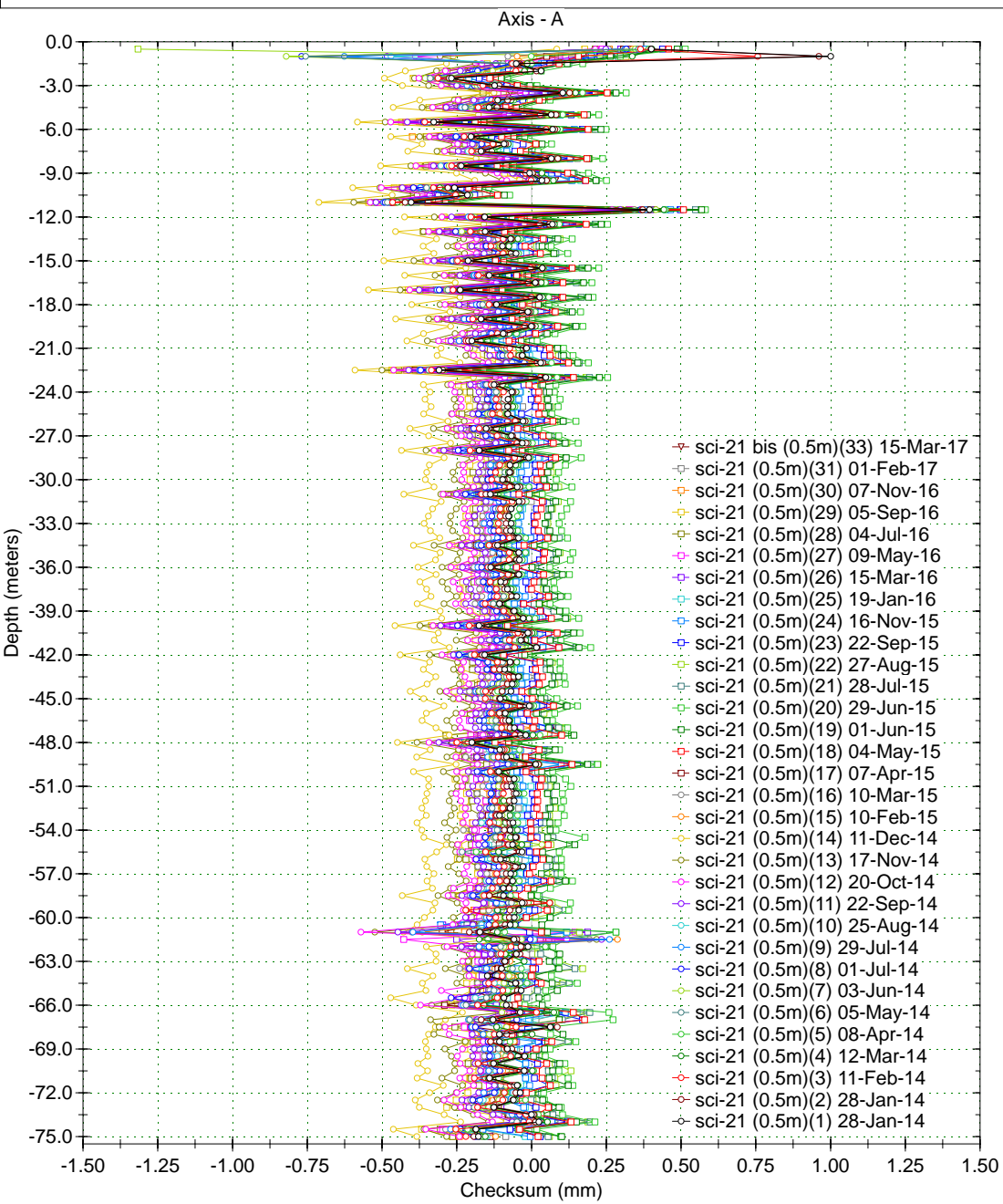
Borehole : sci-21 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 75.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 28 11:07
Applied Azimuth : 0.0 degrees



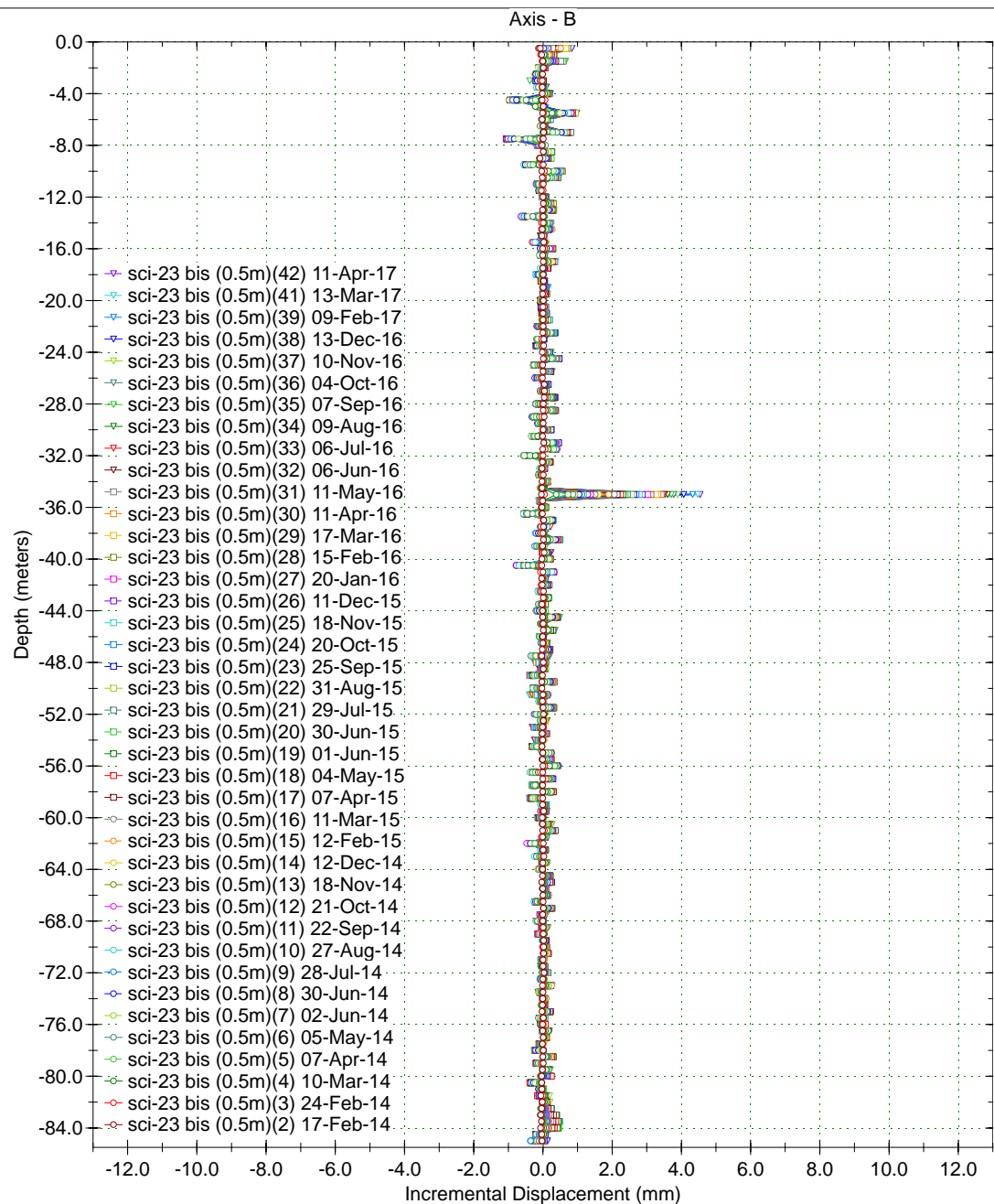
Borehole : sci-21 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 75.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jan 28 11:07
Applied Azimuth : 0.0 degrees



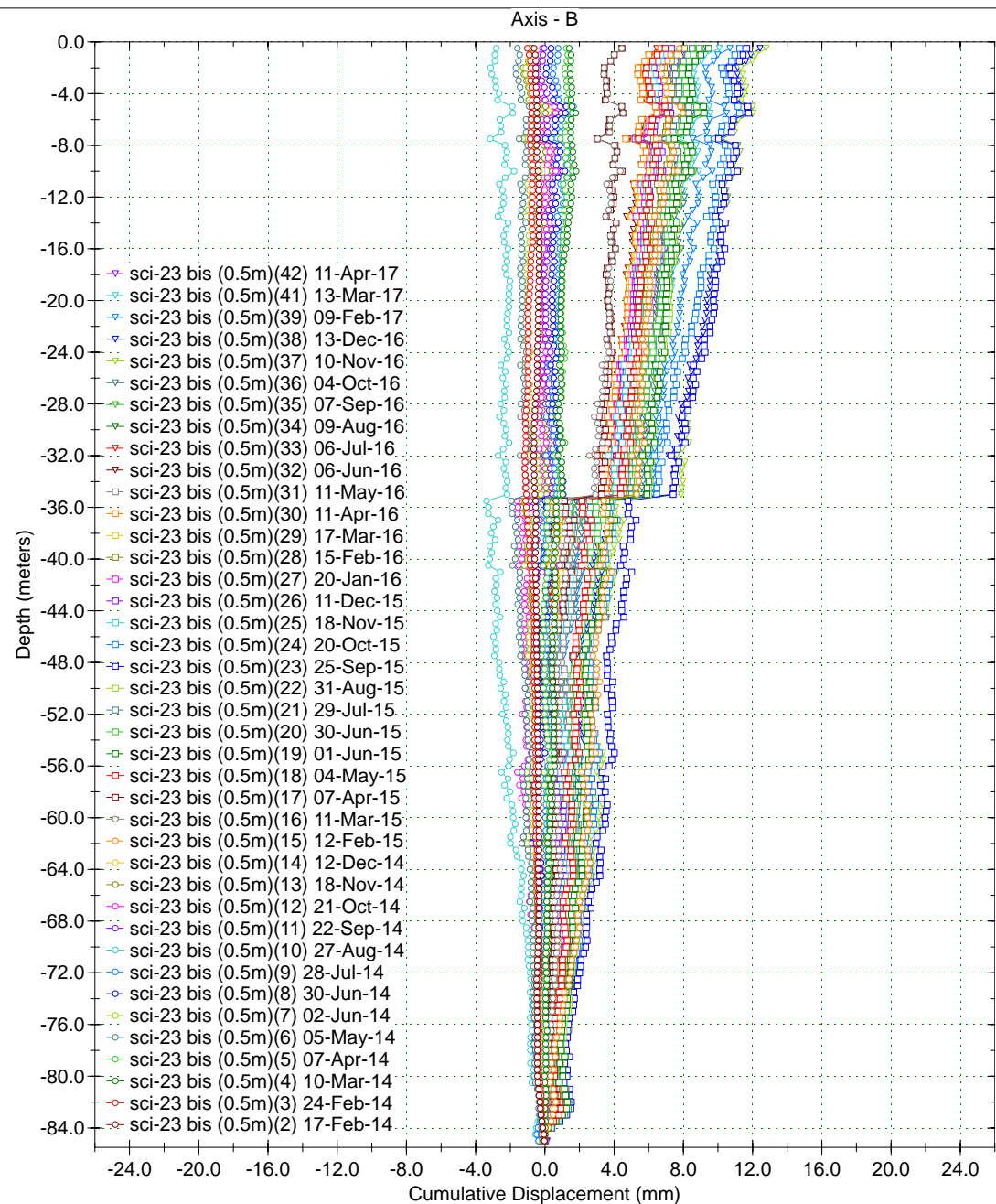
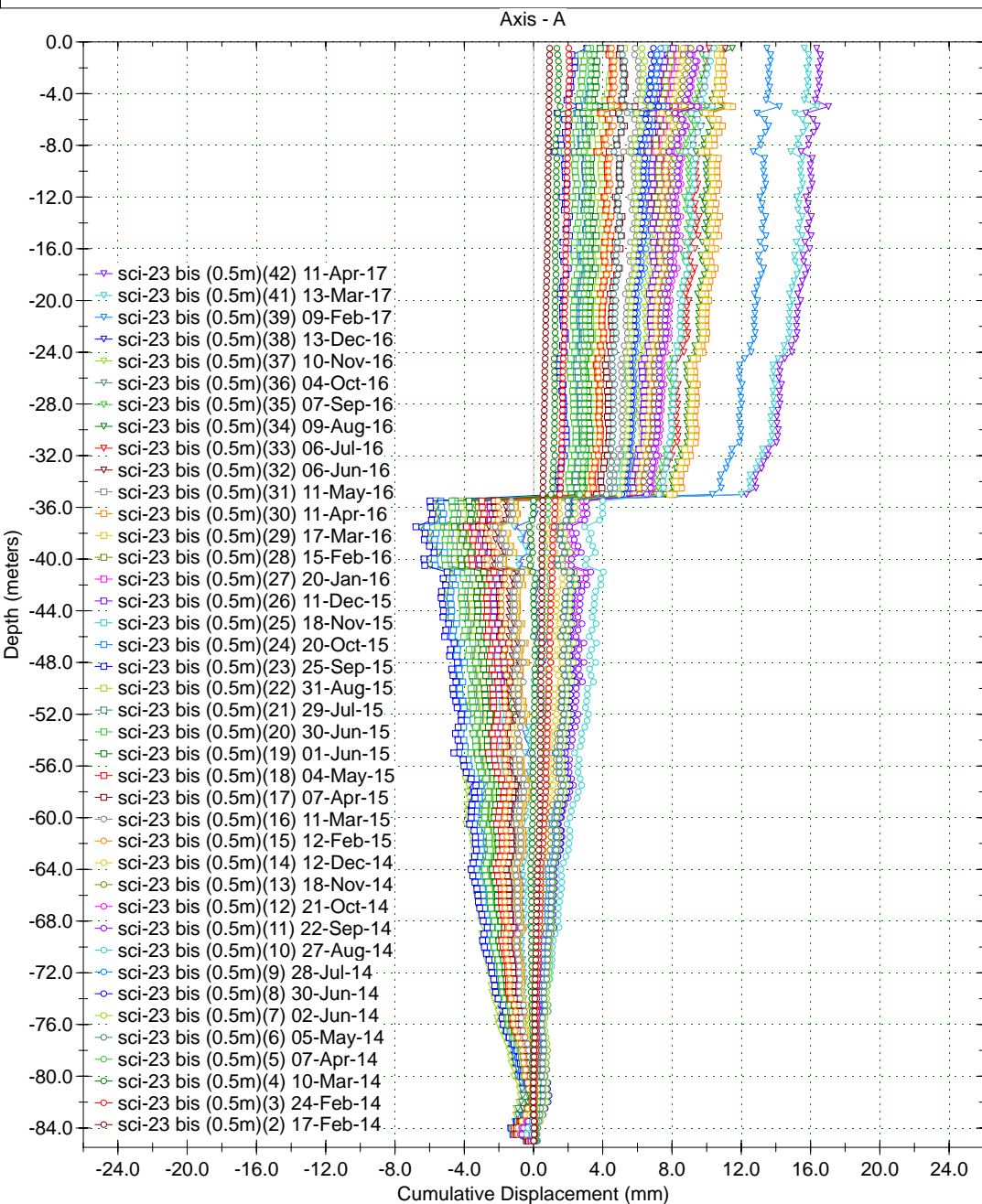
Borehole : sci-23 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 85.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Feb 17 11:34
Applied Azimuth : 0.0 degrees



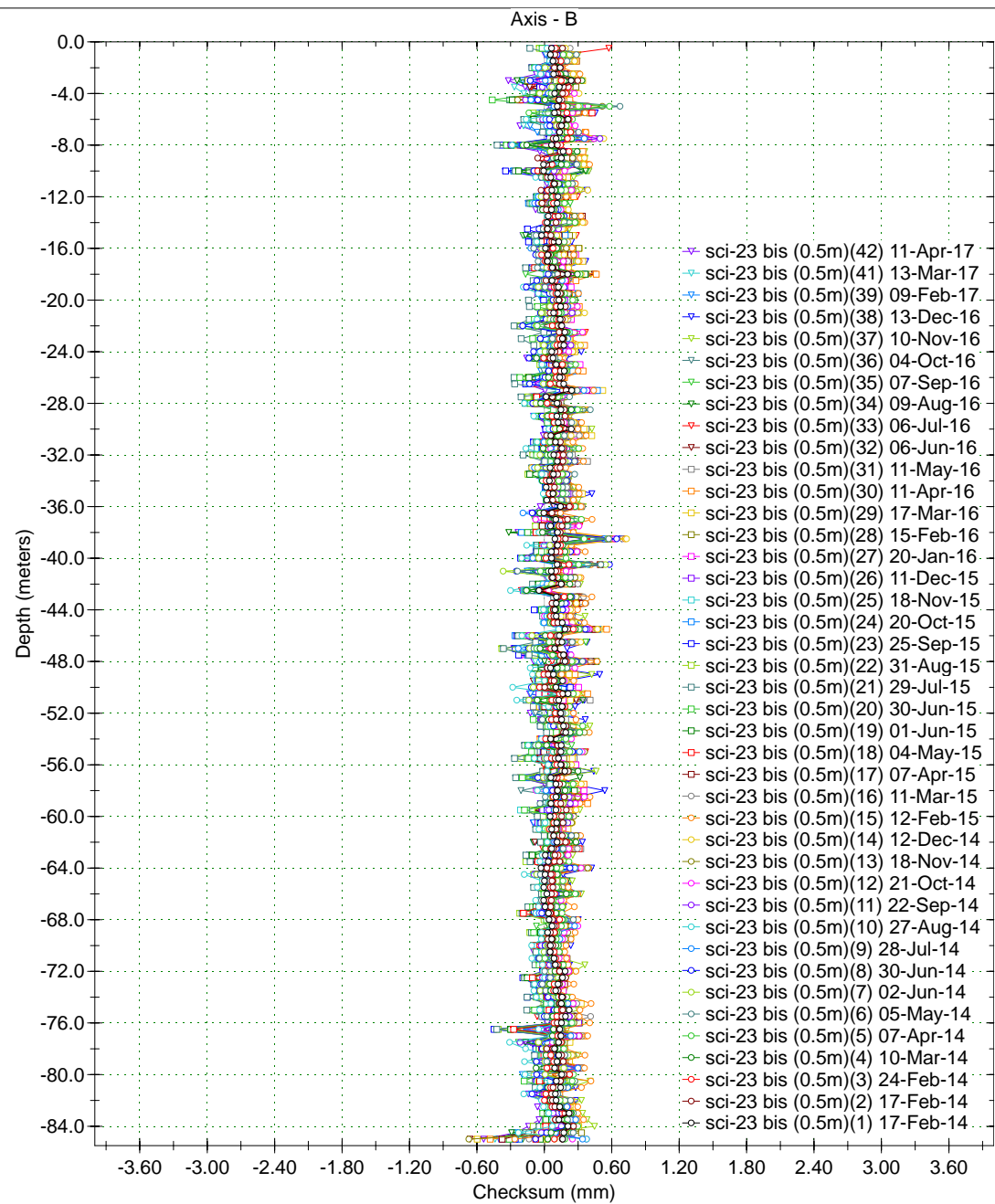
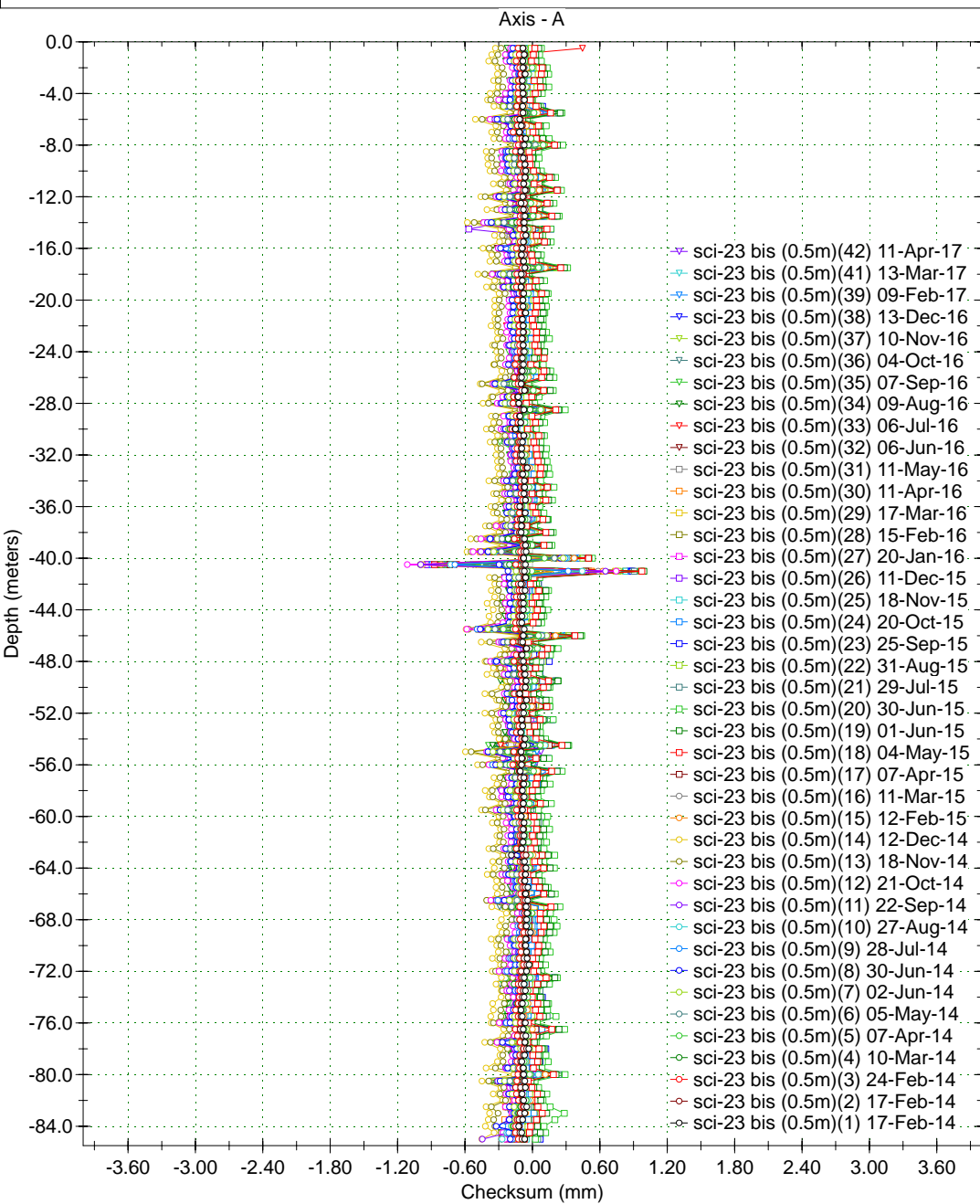
Borehole : sci-23 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 85.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Feb 17 11:34
Applied Azimuth : 0.0 degrees



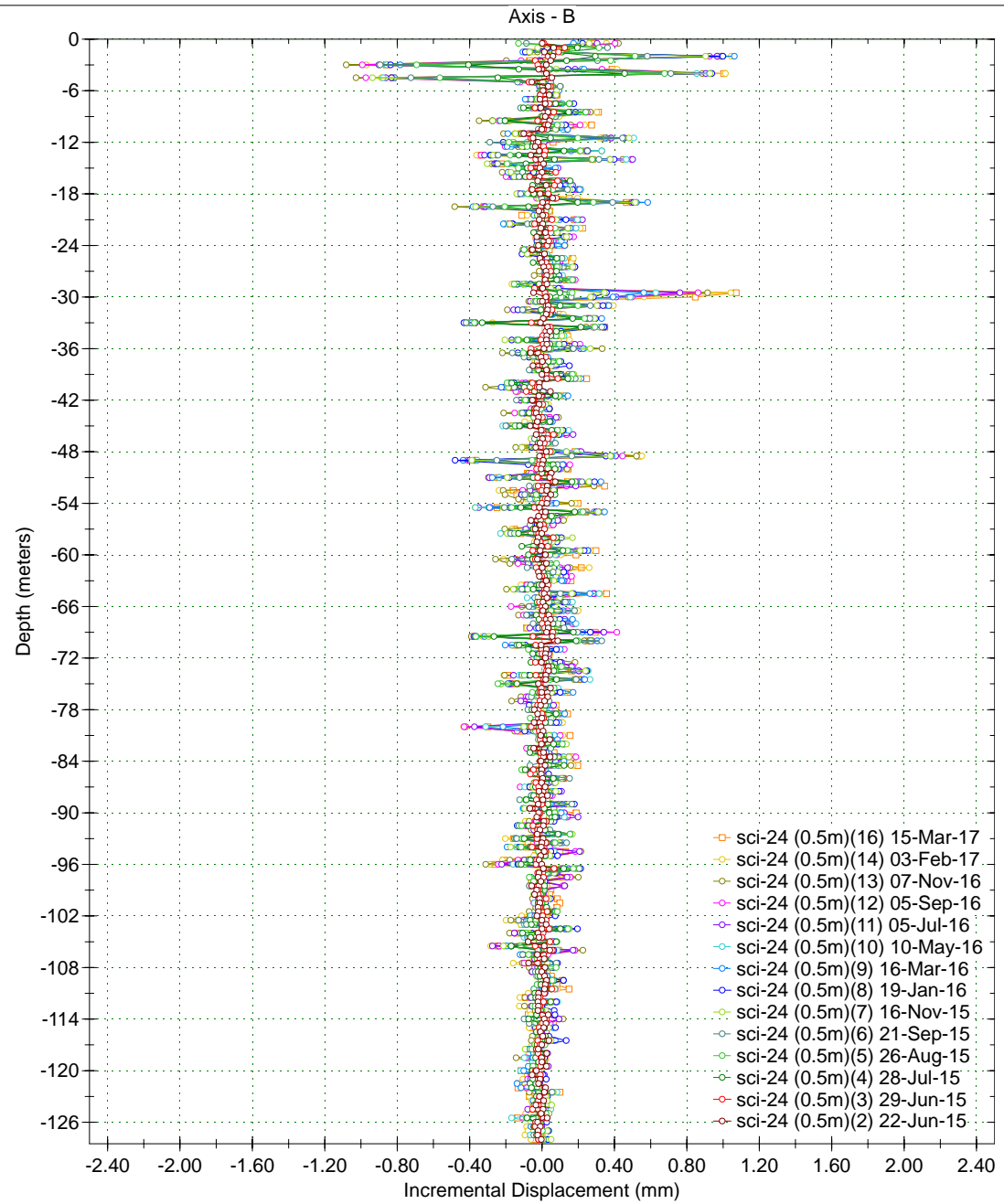
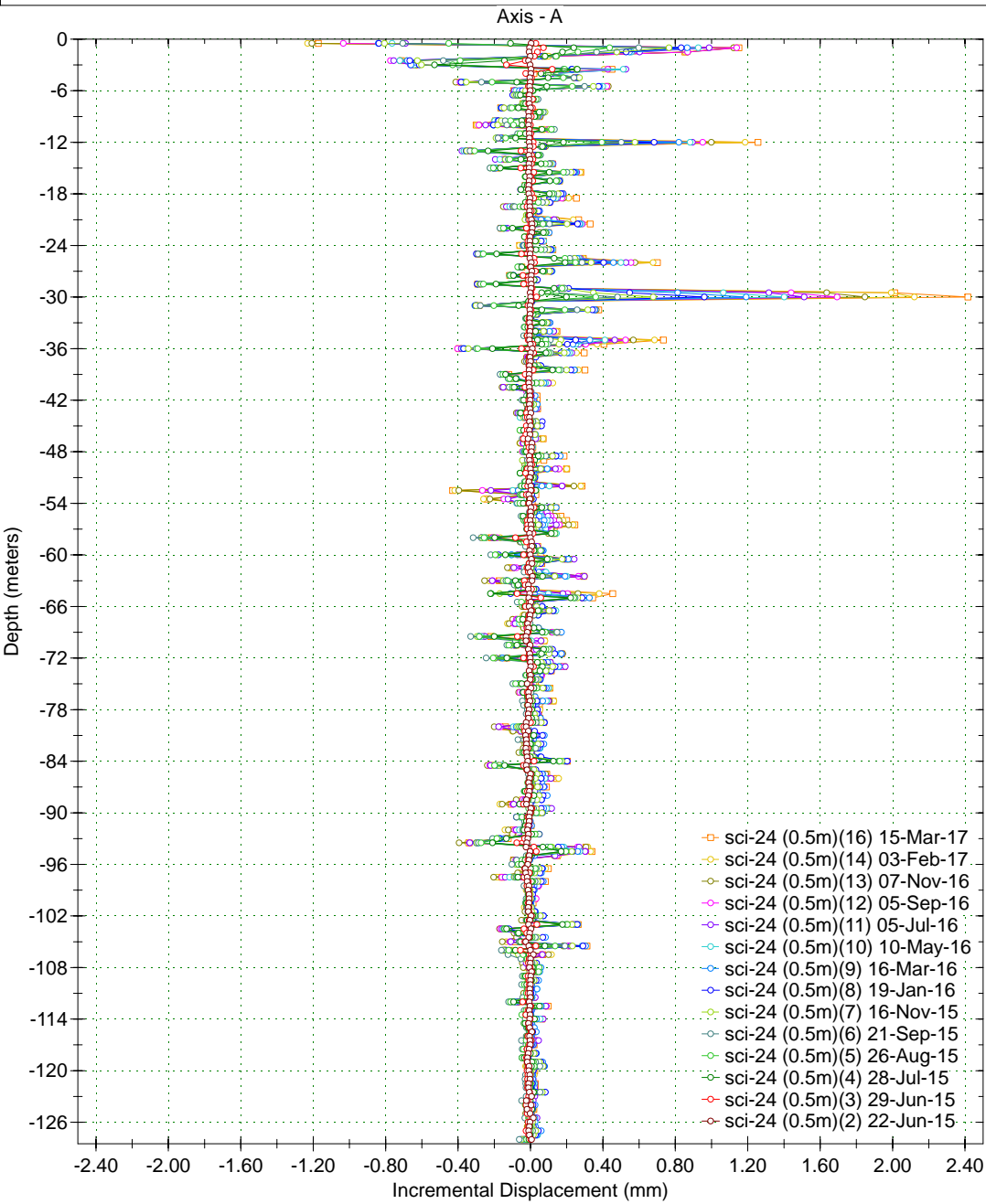
Borehole : sci-23 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 85.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Feb 17 11:34
Applied Azimuth : 0.0 degrees



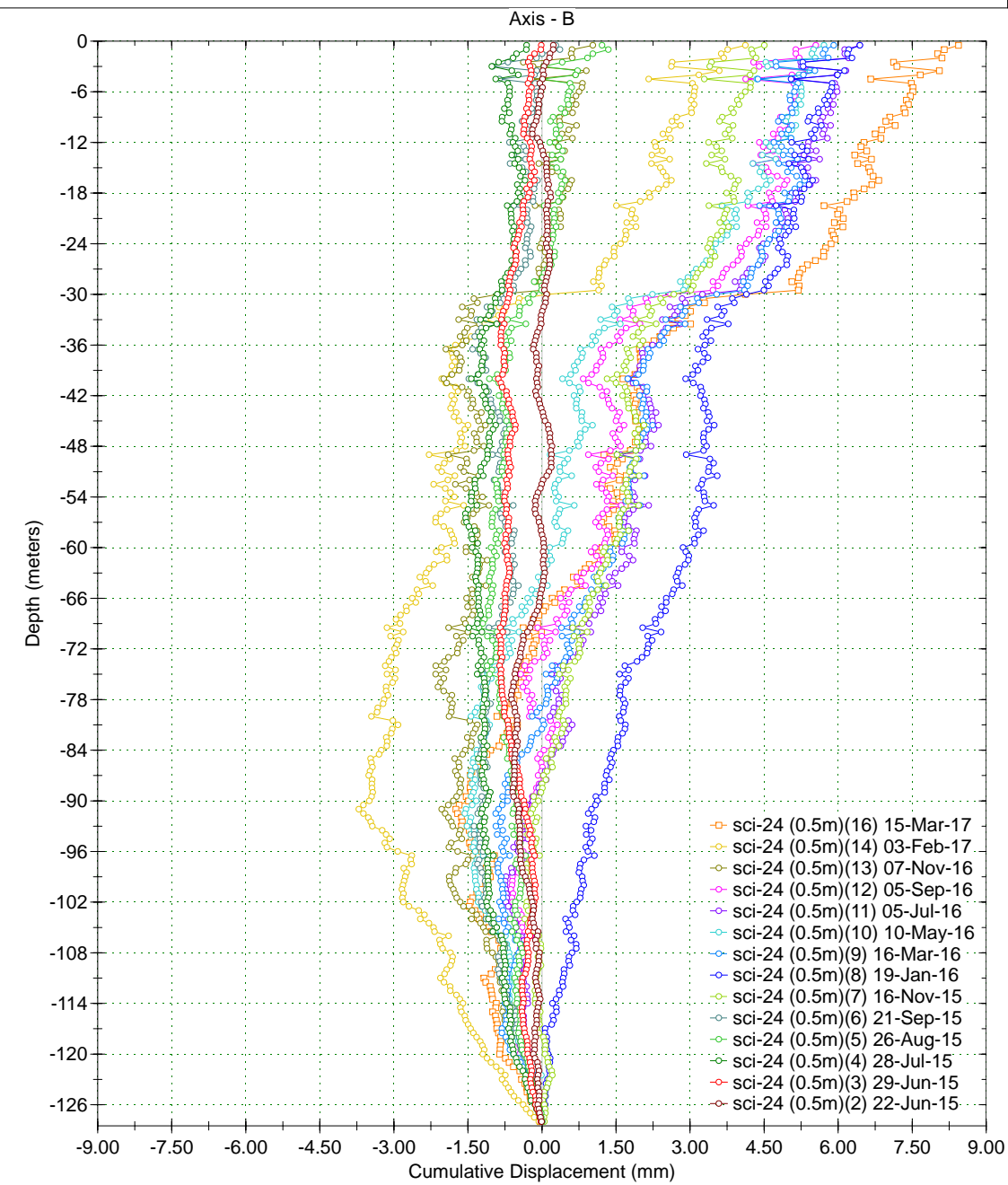
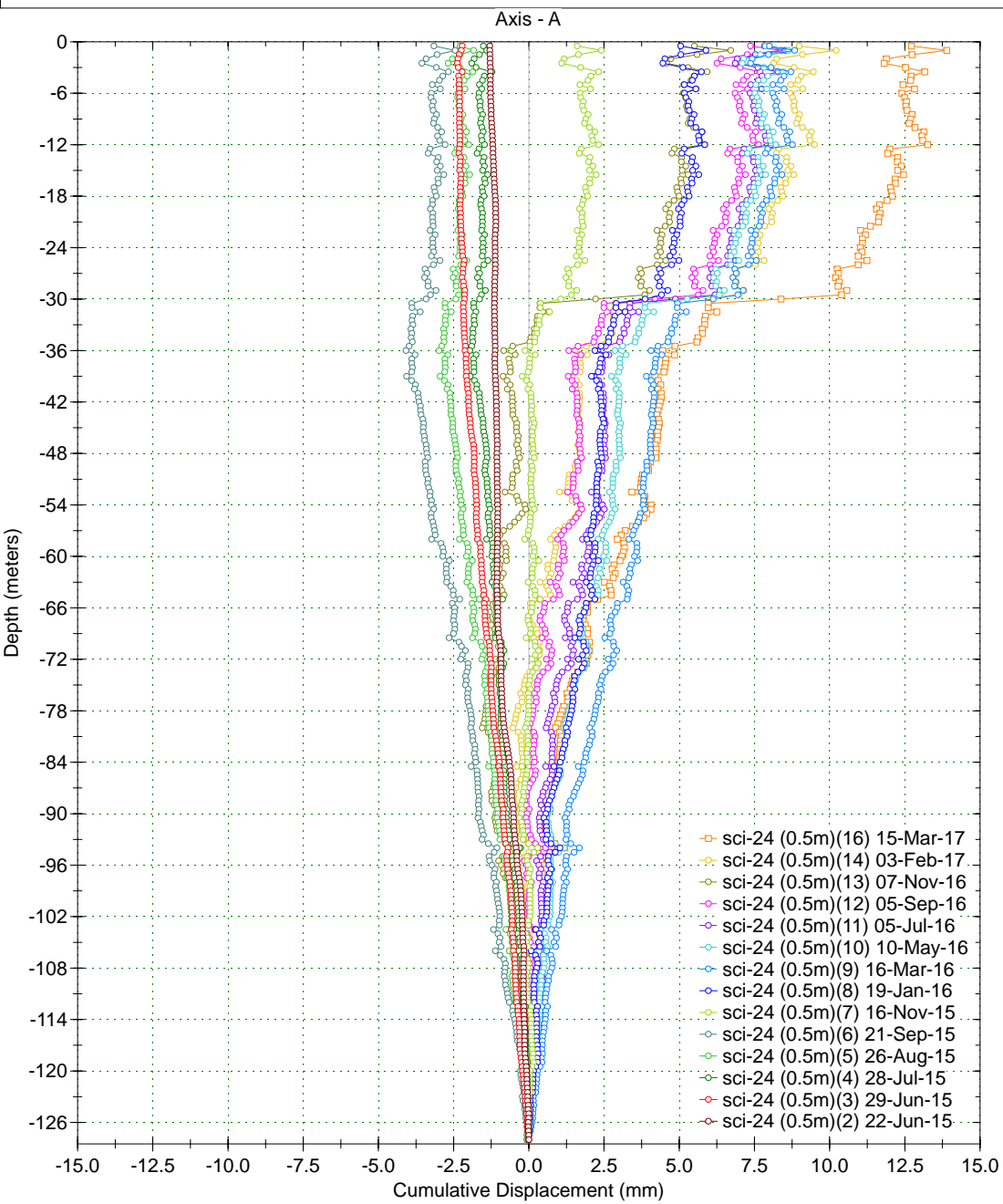
Borehole : sci-24
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 128.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Jun 22 11:12
 Applied Azimuth : 0.0 degrees



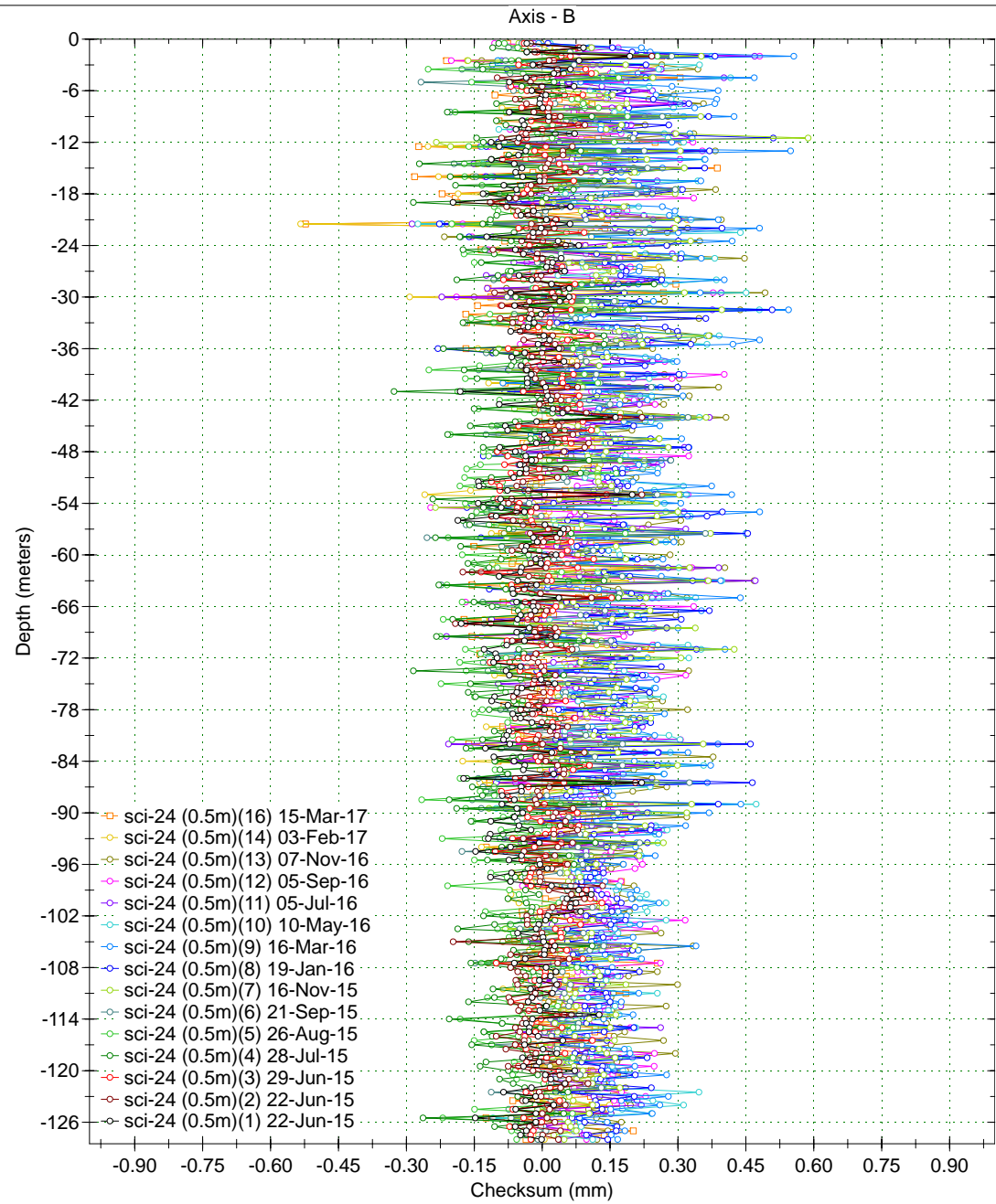
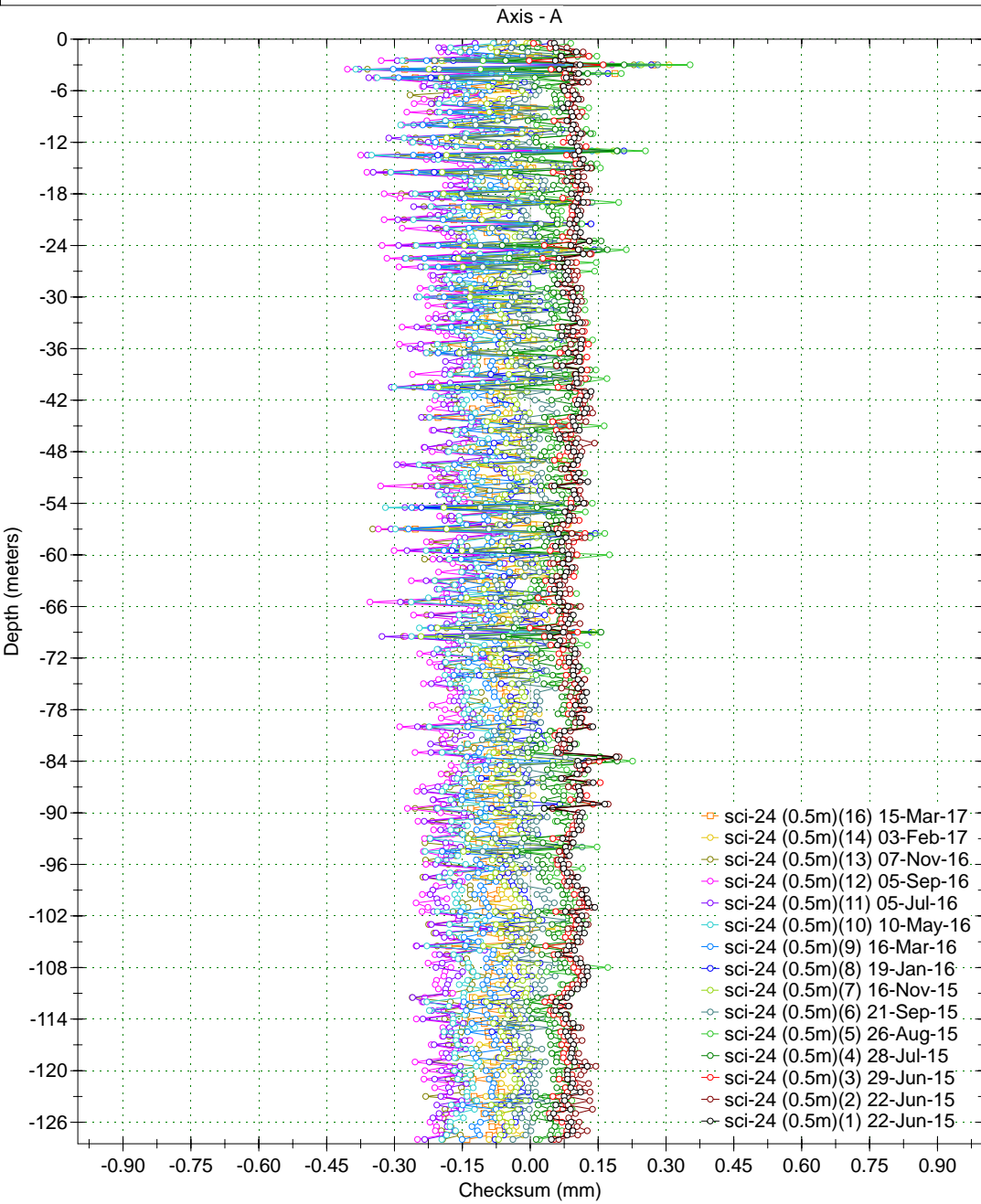
Borehole : sci-24
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 128.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Jun 22 11:12
Applied Azimuth : 0.0 degrees



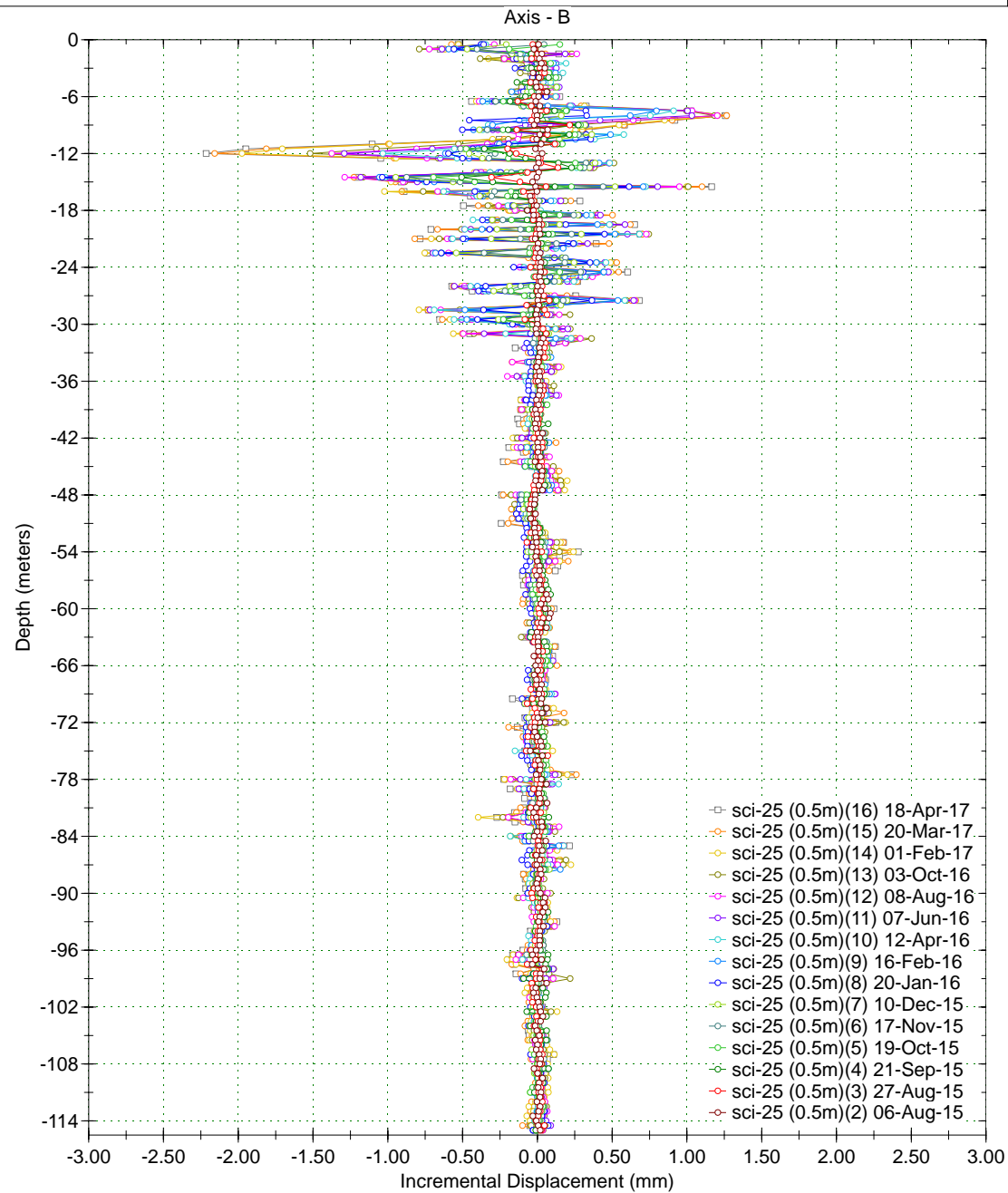
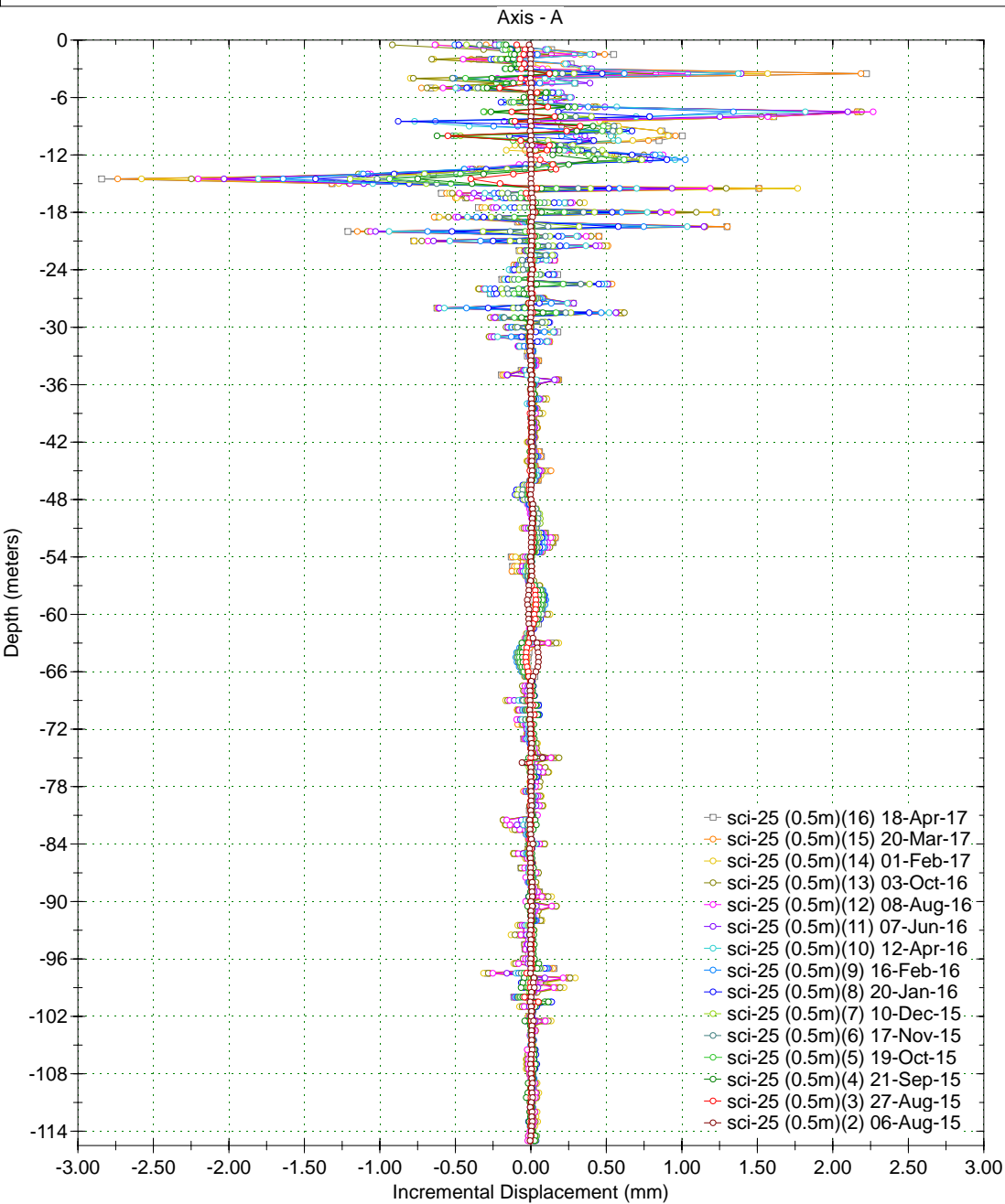
Borehole : sci-24
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 128.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Jun 22 11:12
Applied Azimuth : 0.0 degrees



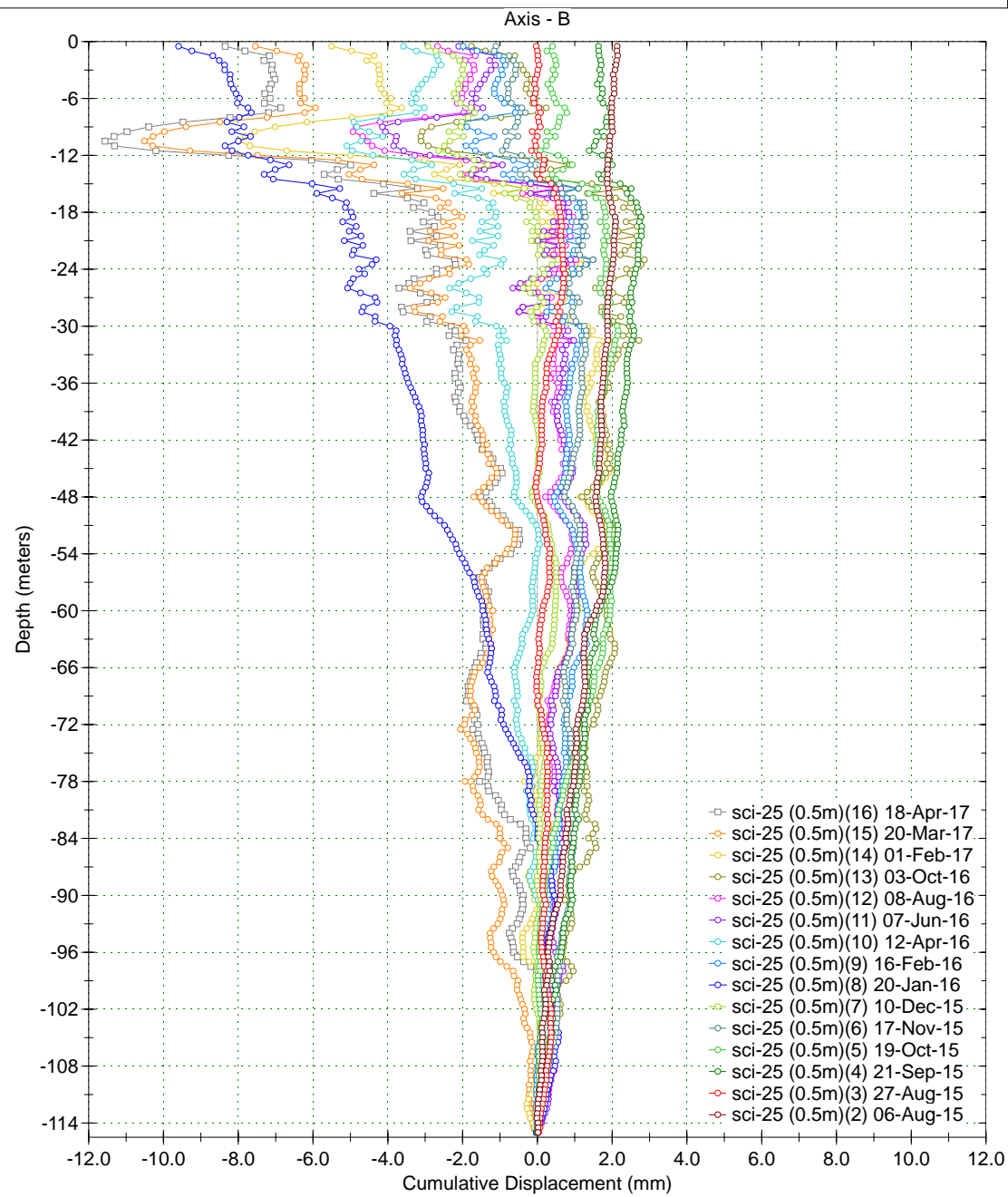
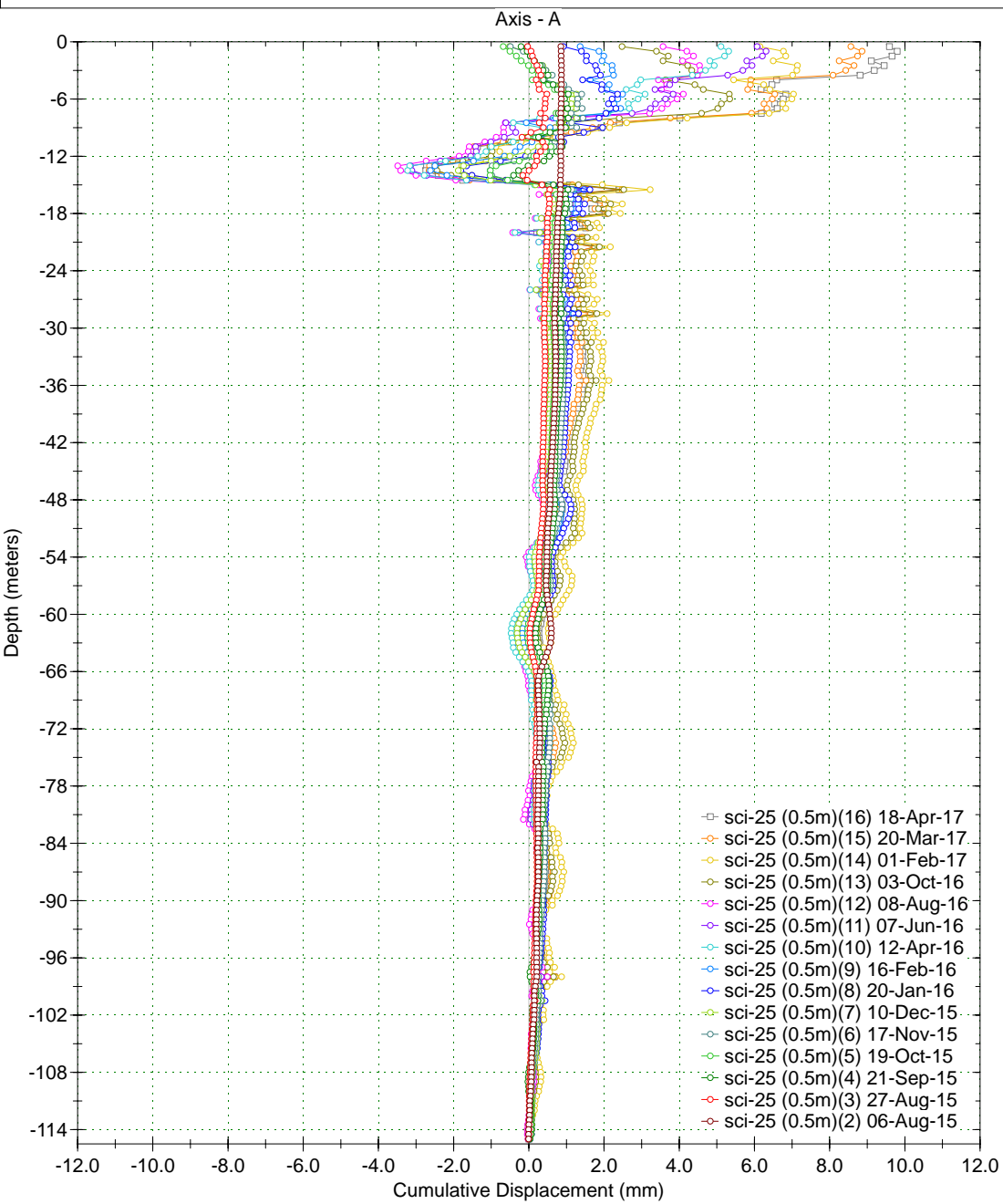
Borehole : sci-25
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 115.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Aug 06 11:10
 Applied Azimuth : 0.0 degrees



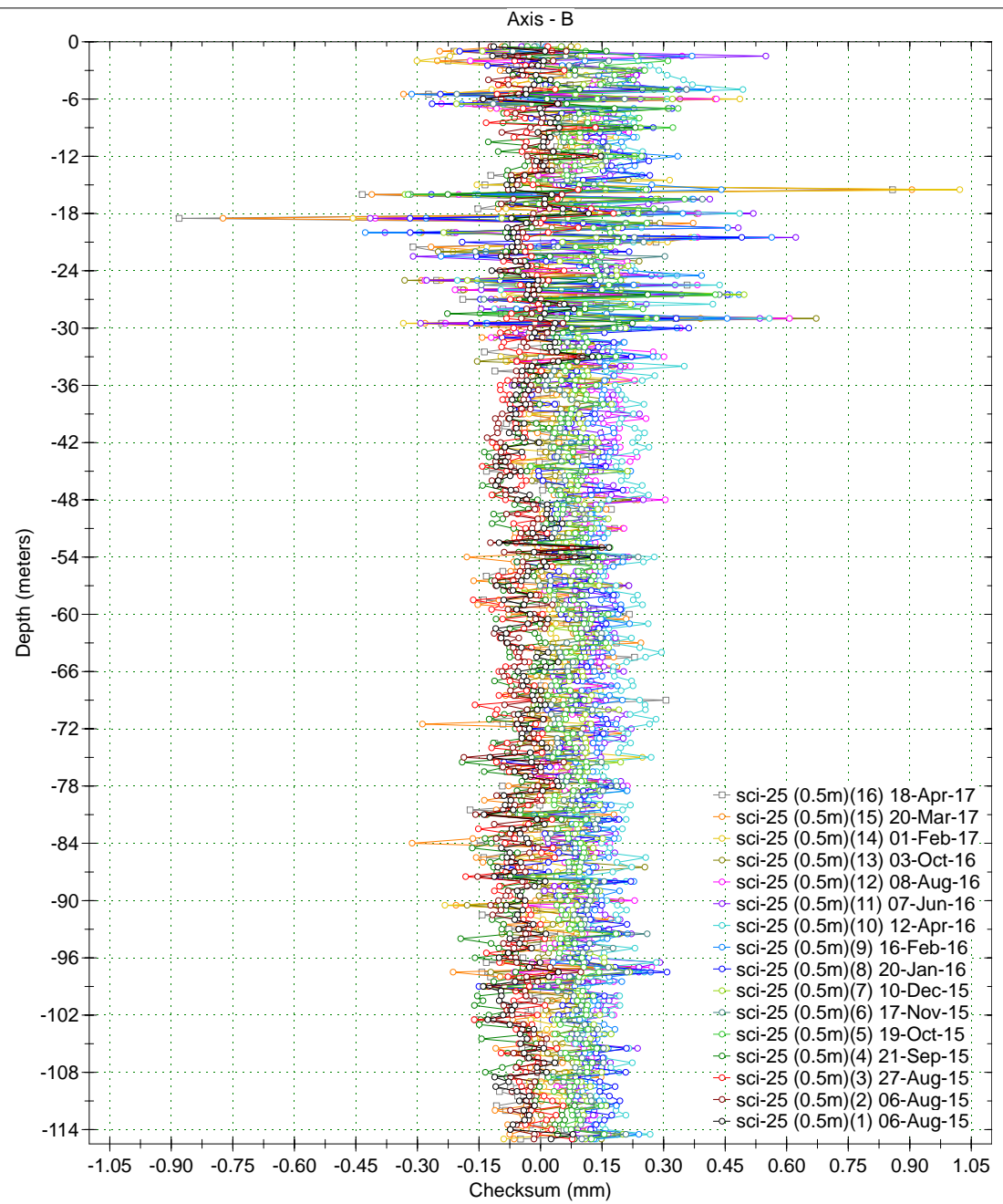
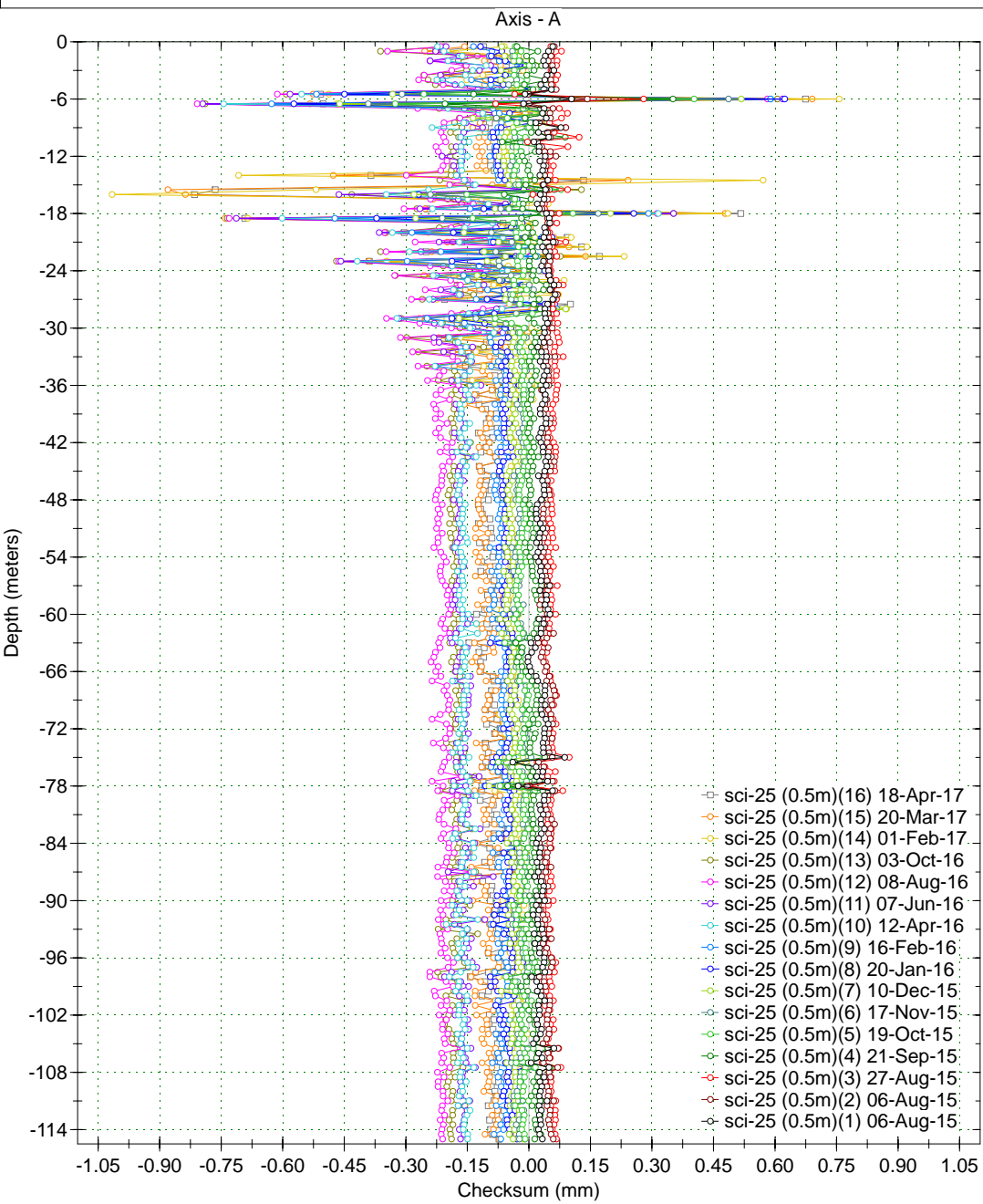
Borehole : sci-25
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 115.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Aug 06 11:10
 Applied Azimuth : 0.0 degrees



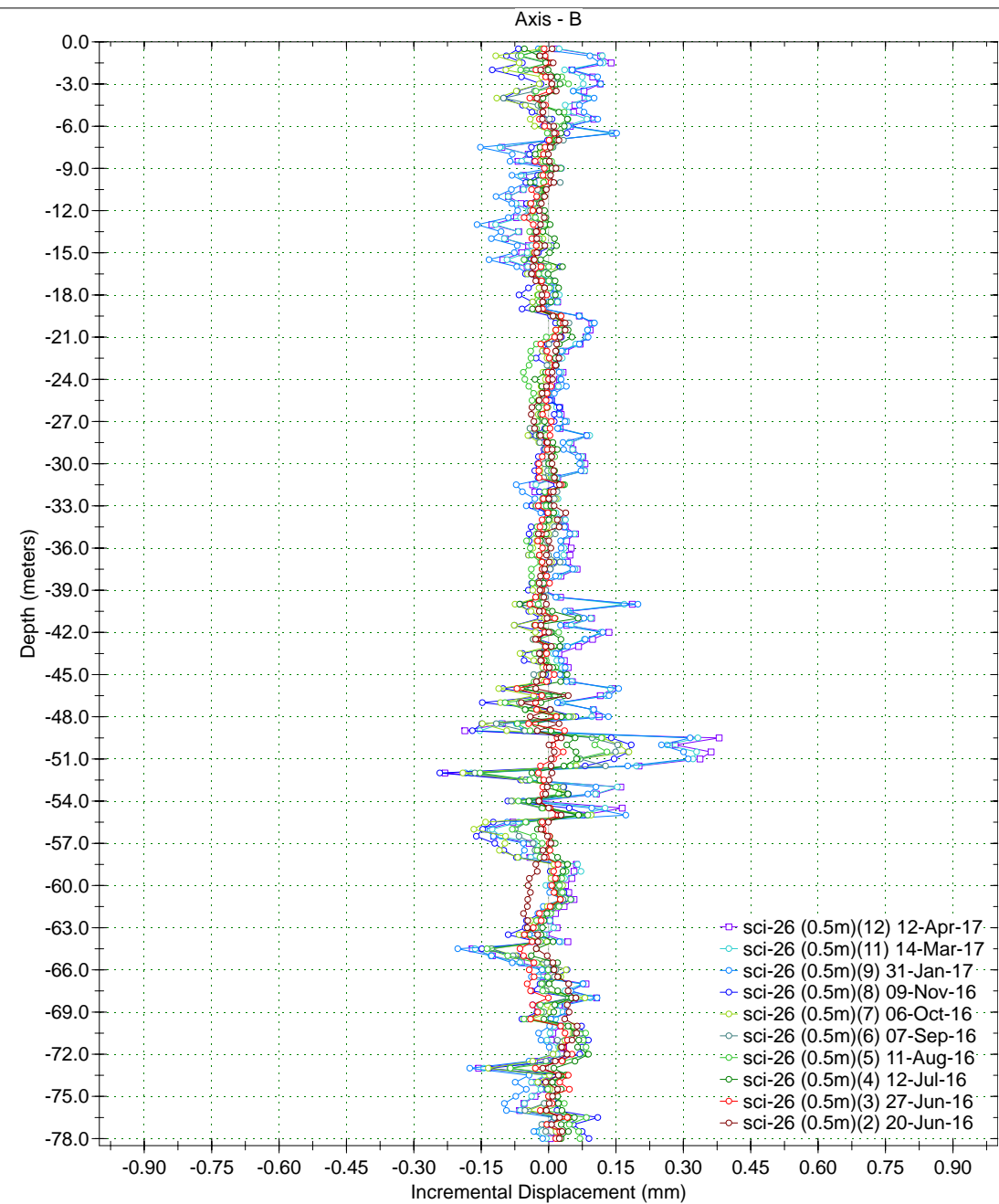
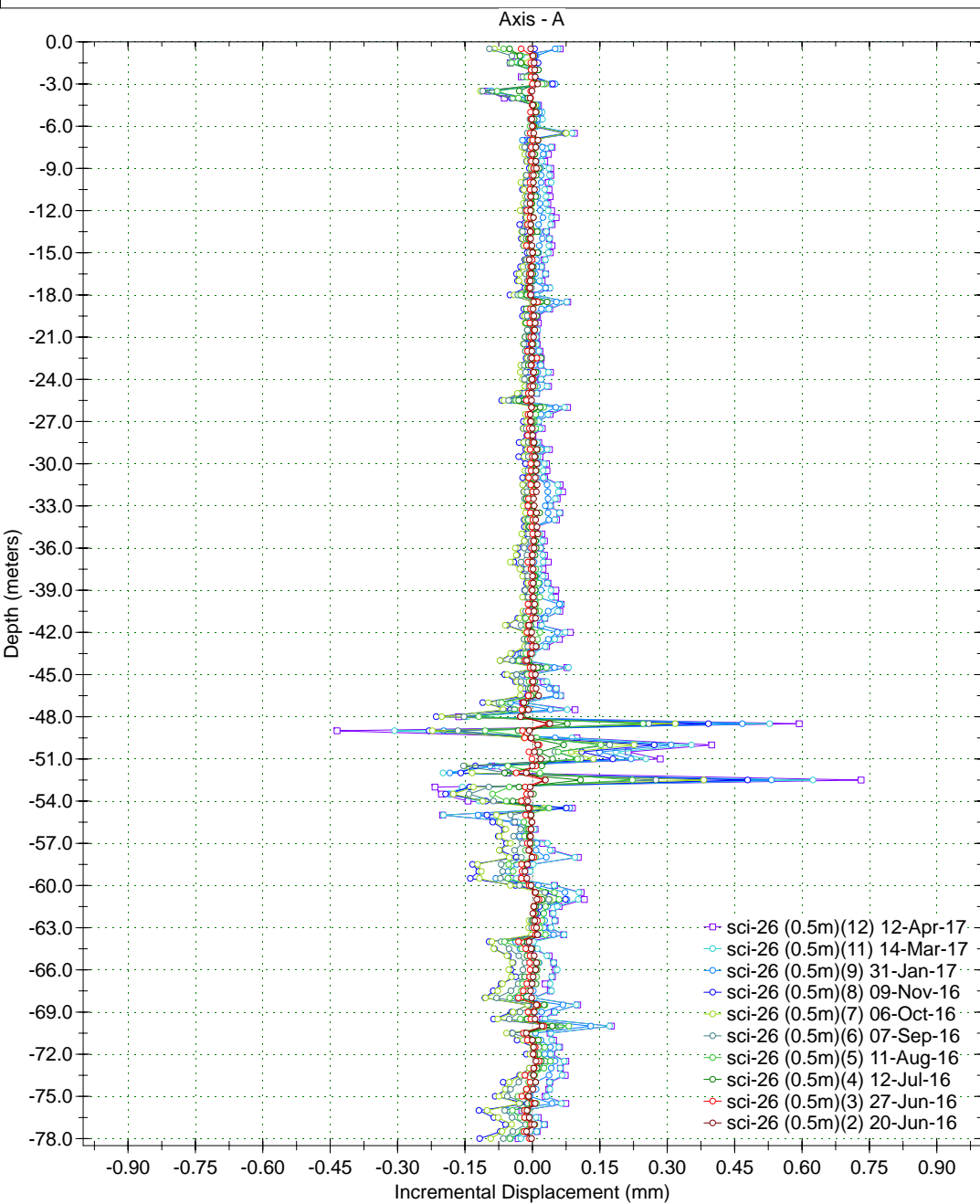
Borehole : sci-25
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 115.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Aug 06 11:10
Applied Azimuth : 0.0 degrees



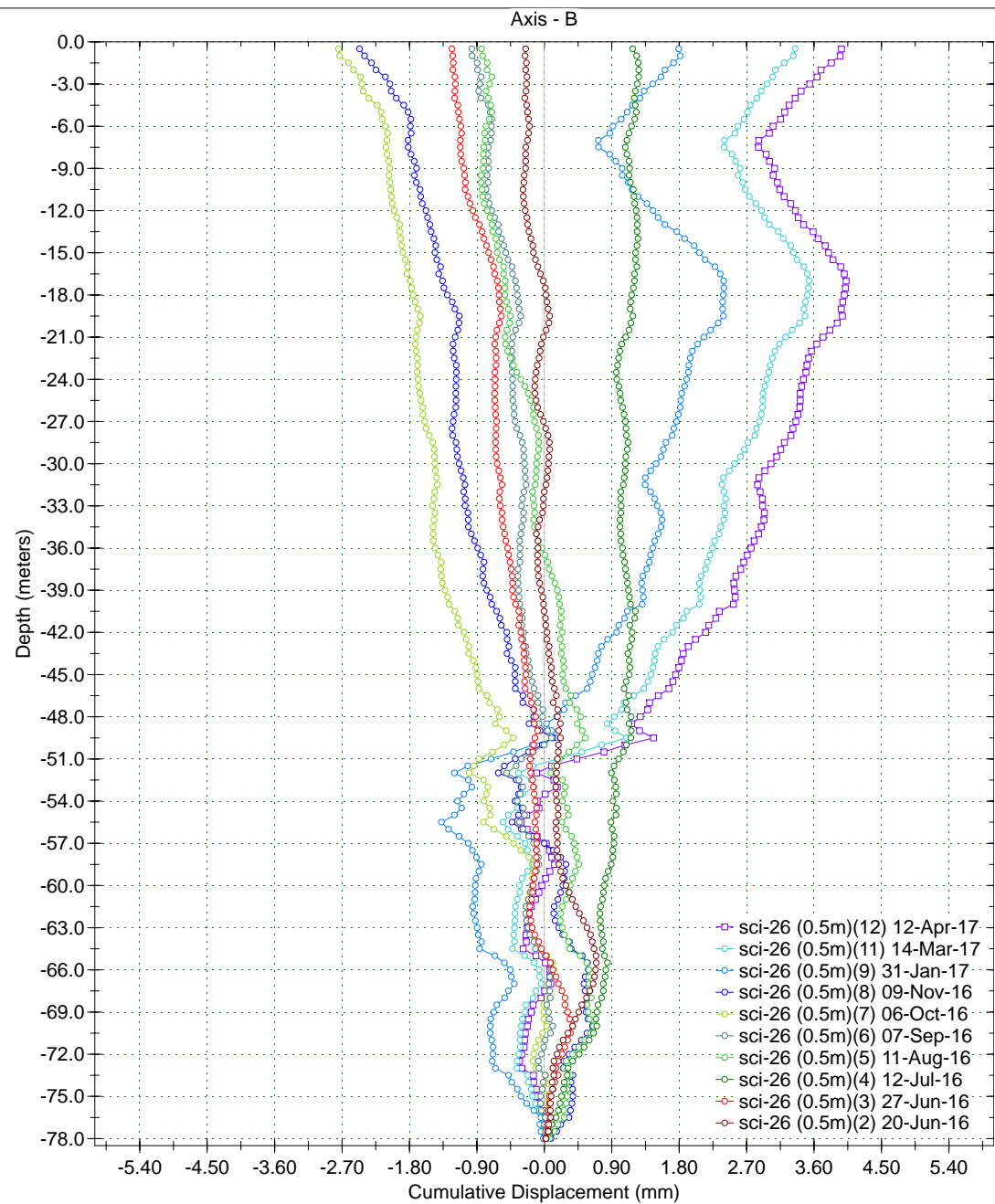
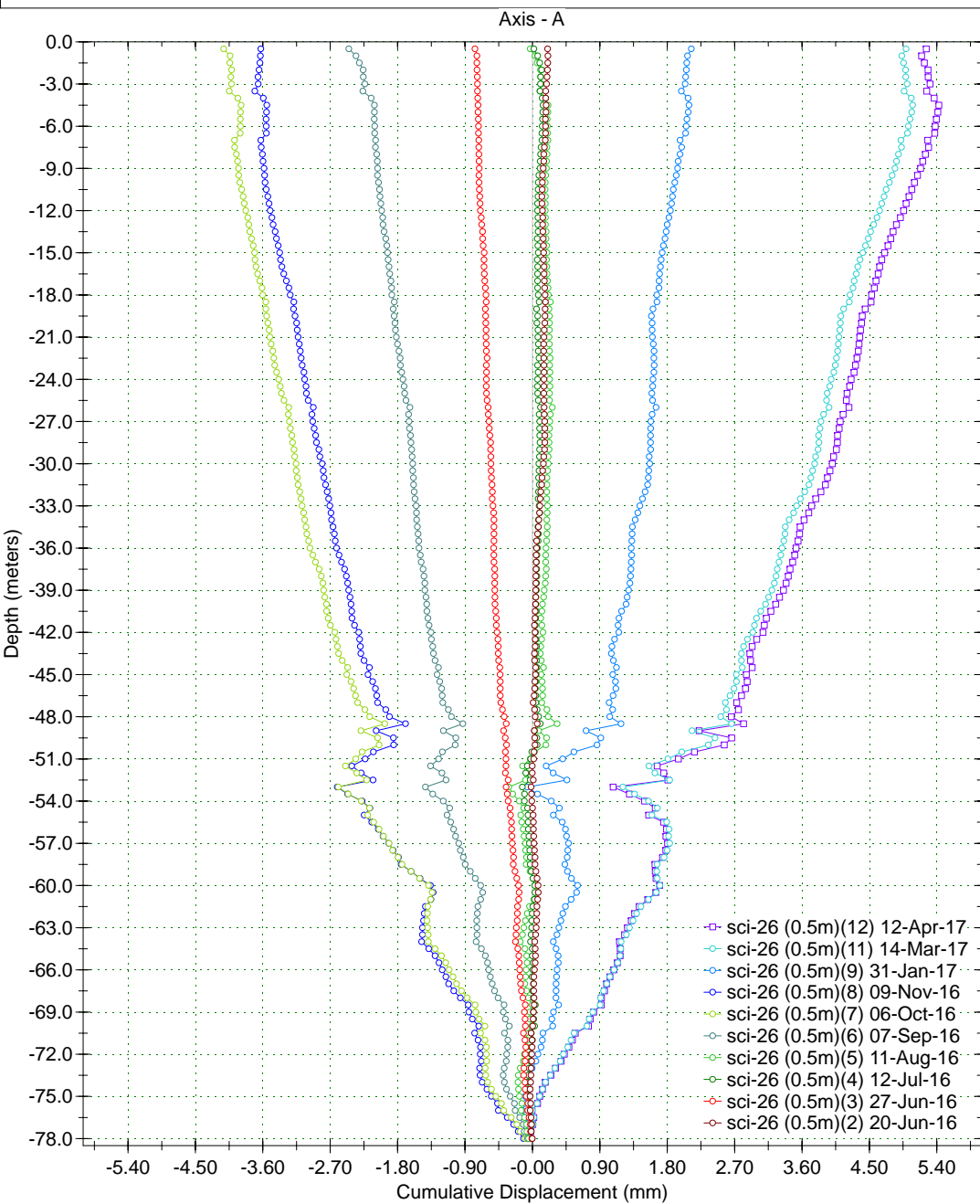
Borehole : sci-26
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 78.0 meters
 A+ Groove Azimuth :
 Base Reading : 2016 Jun 20 10:29
 Applied Azimuth : 0.0 degrees



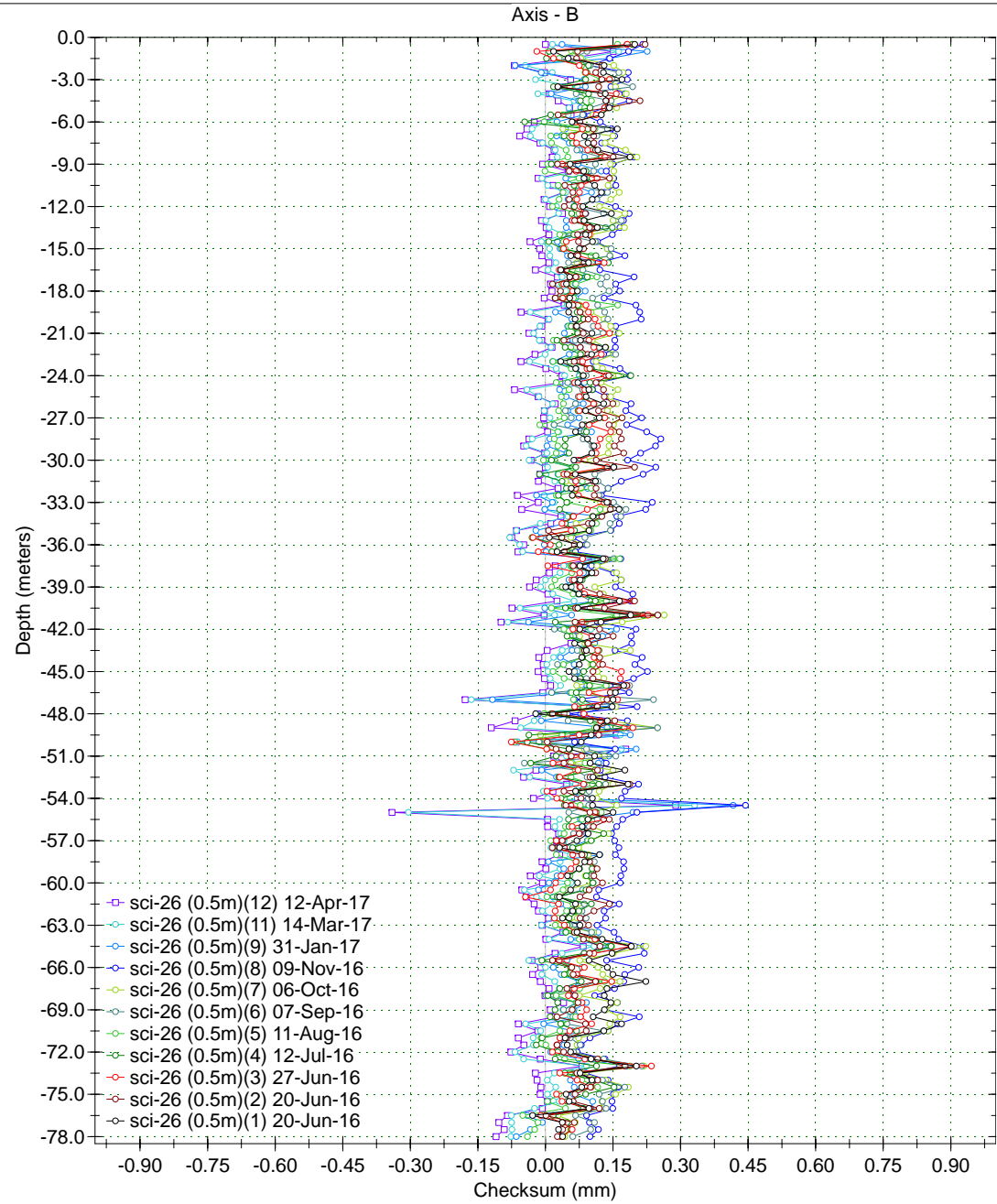
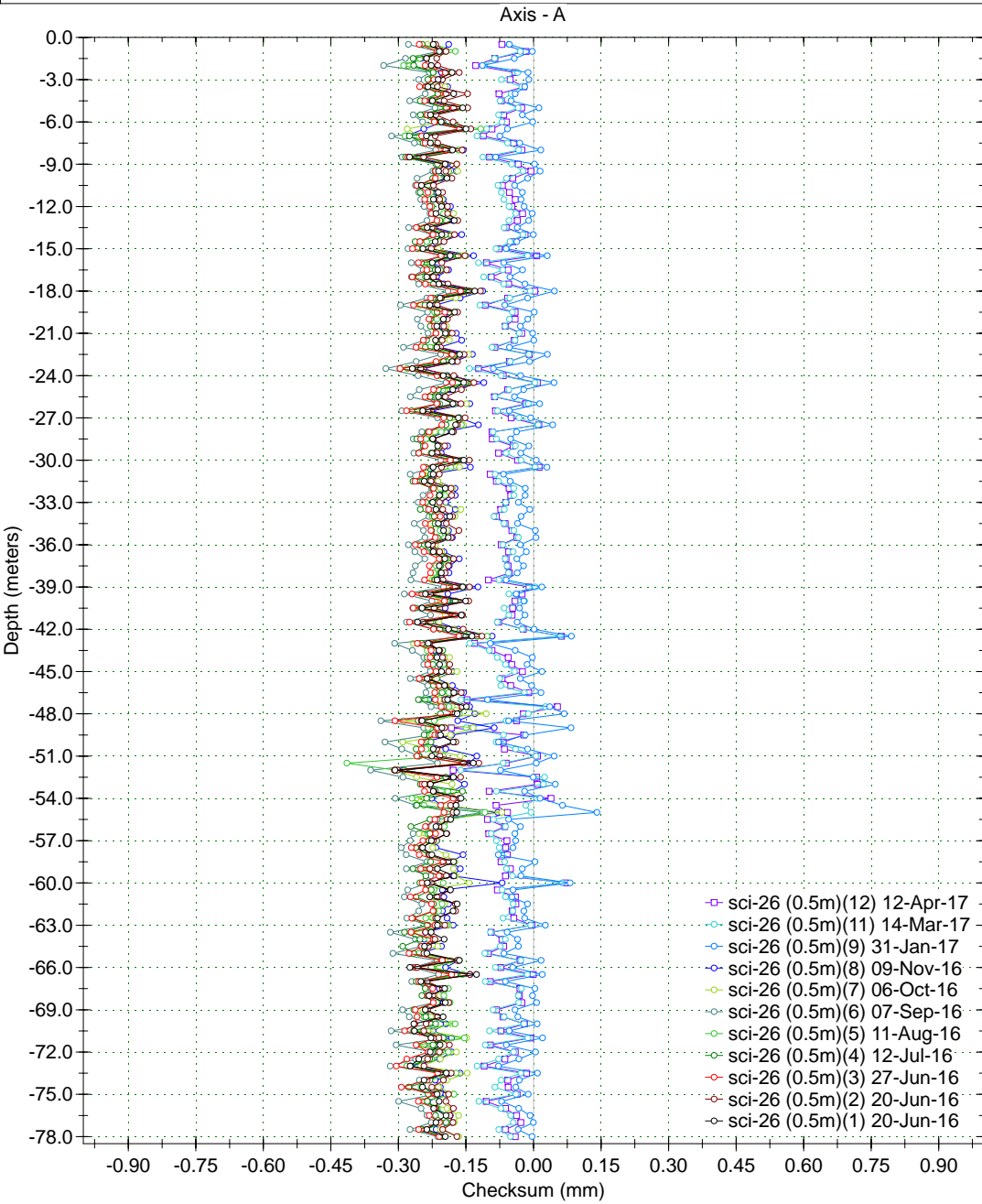
Borehole : sci-26
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 78.0 meters
 A+ Groove Azimuth :
 Base Reading : 2016 Jun 20 10:29
 Applied Azimuth : 0.0 degrees



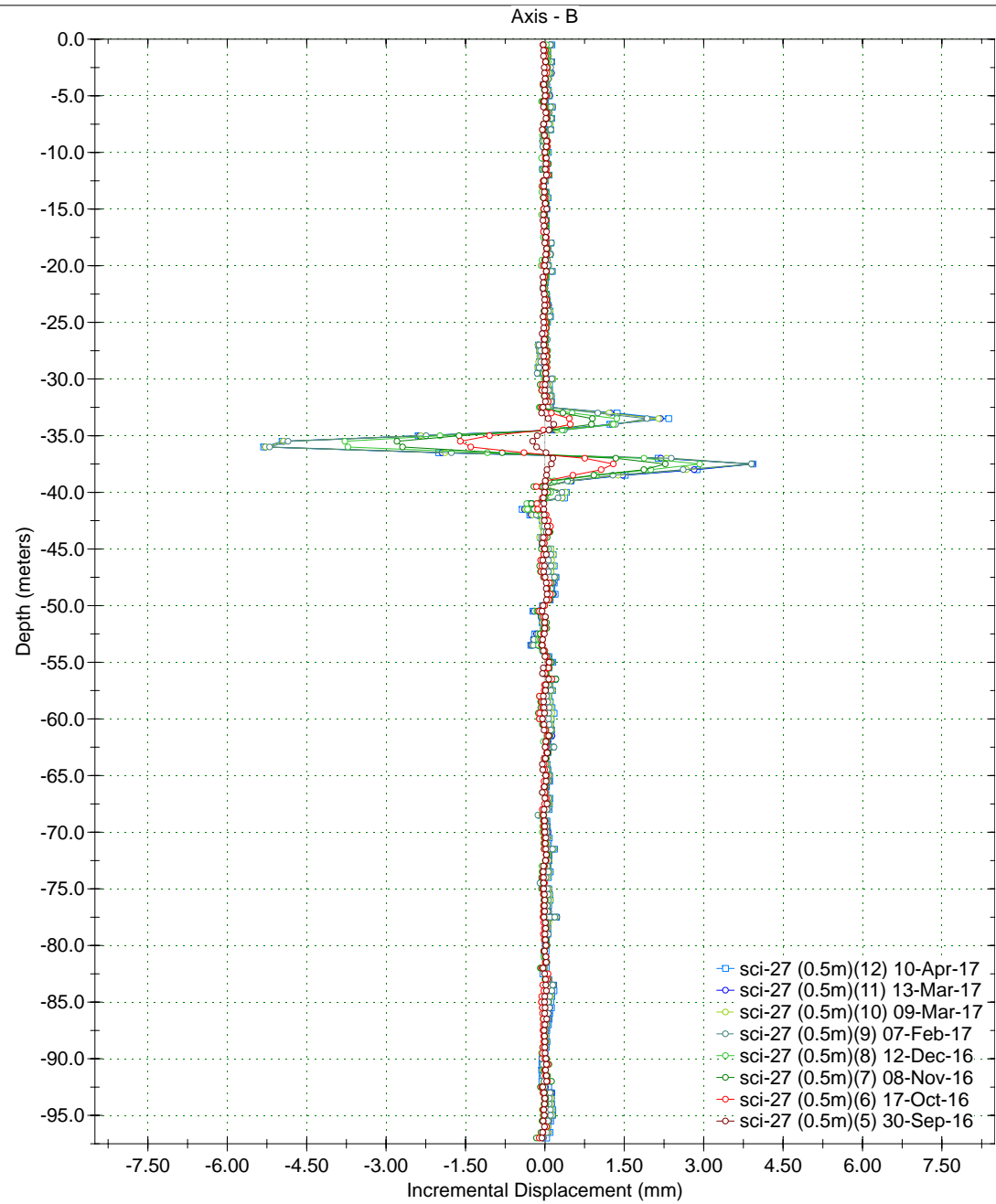
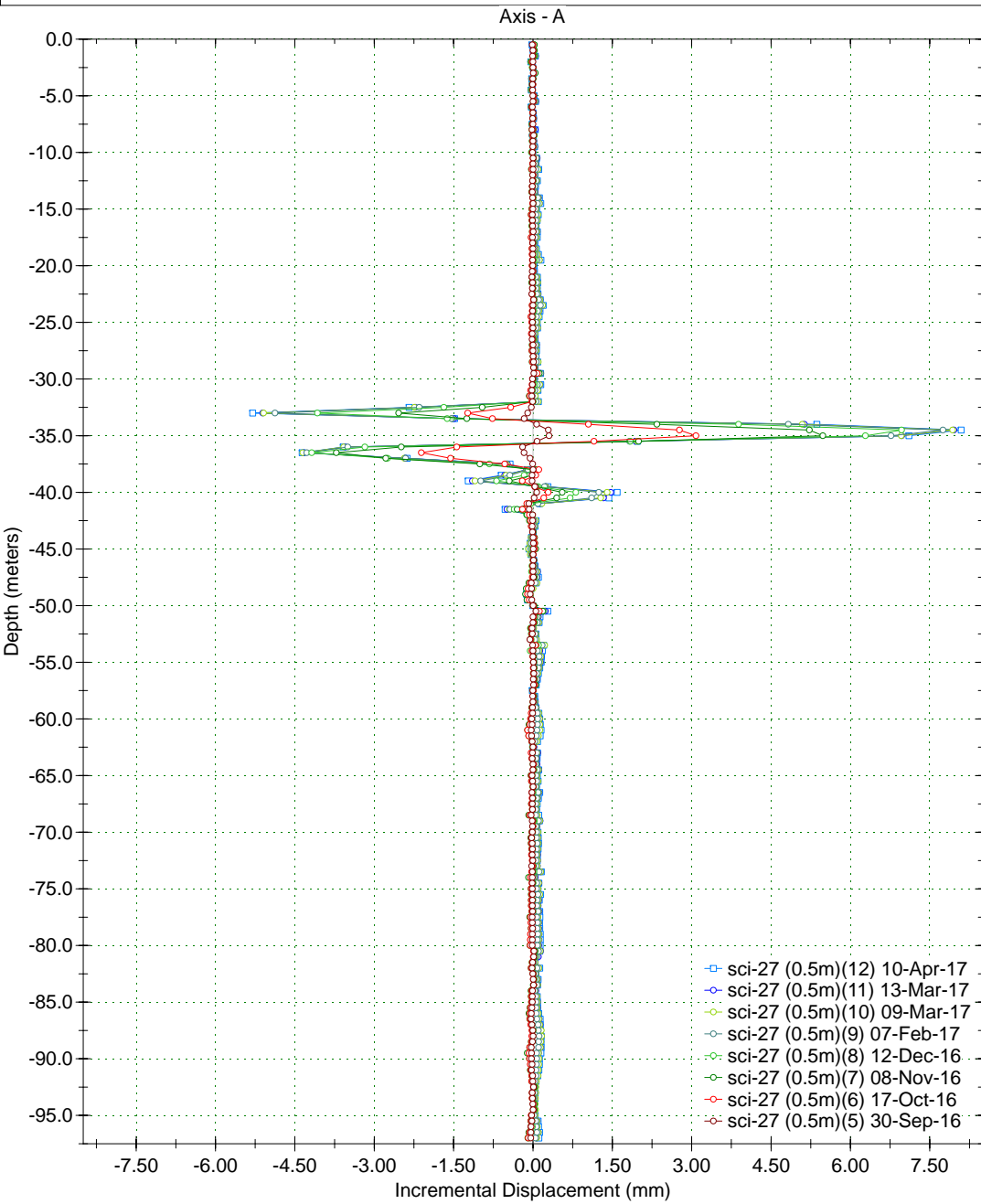
Borehole : sci-26
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 78.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Jun 20 10:29
Applied Azimuth : 0.0 degrees



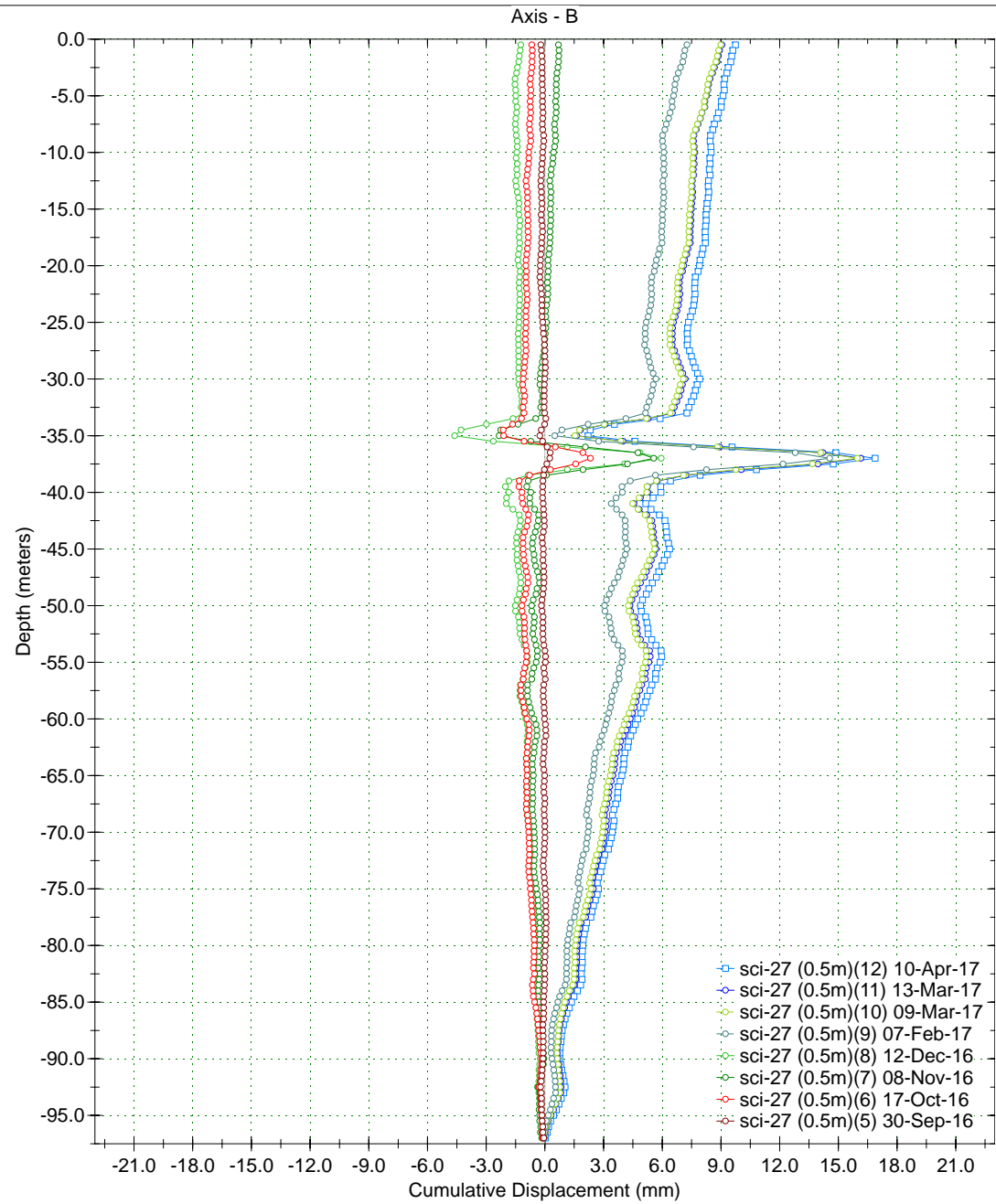
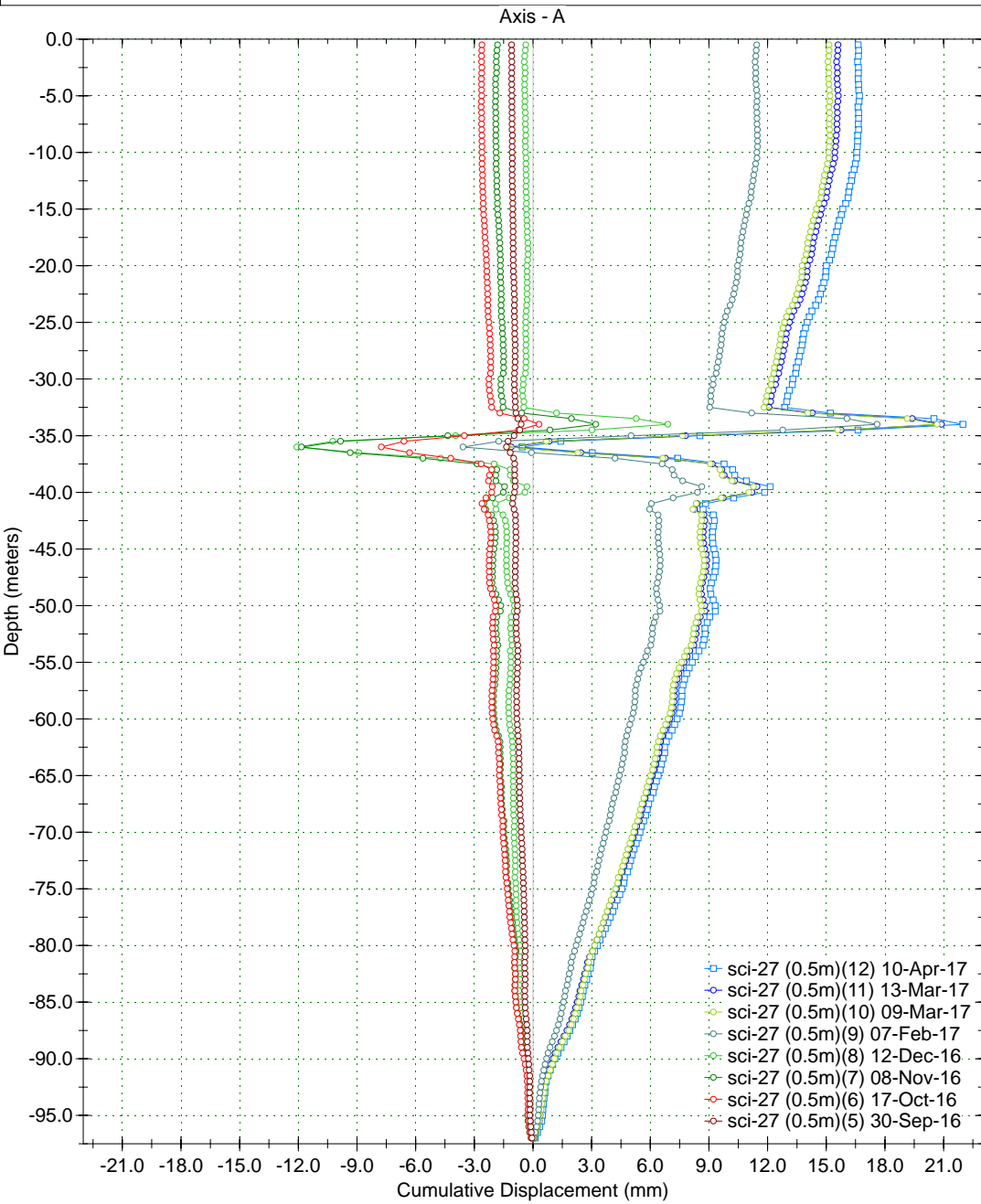
Borehole : sci-27
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 97.0 meters
 A+ Groove Azimuth :
 Base Reading : 2016 Sep 26 10:12
 Applied Azimuth : 0.0 degrees



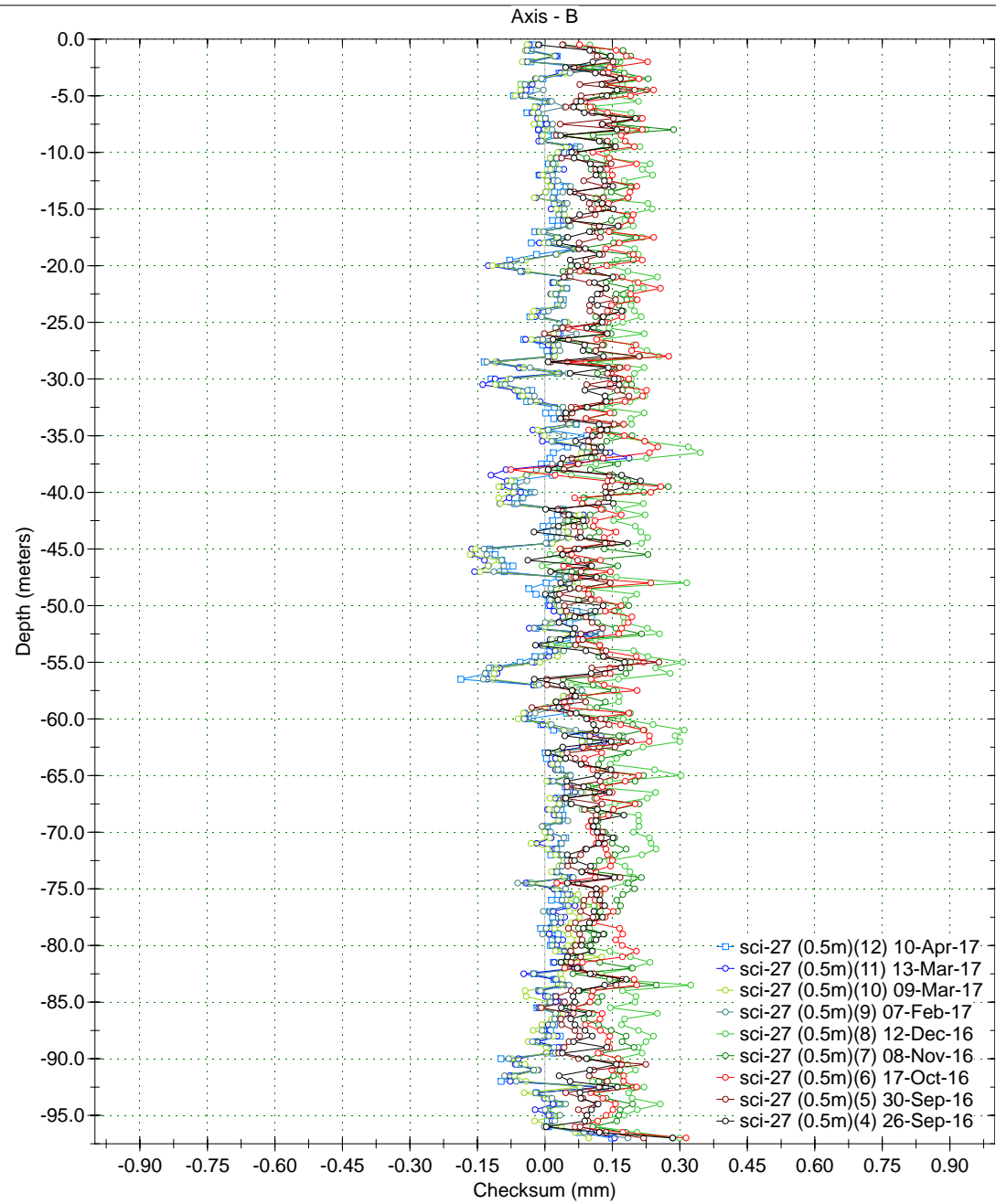
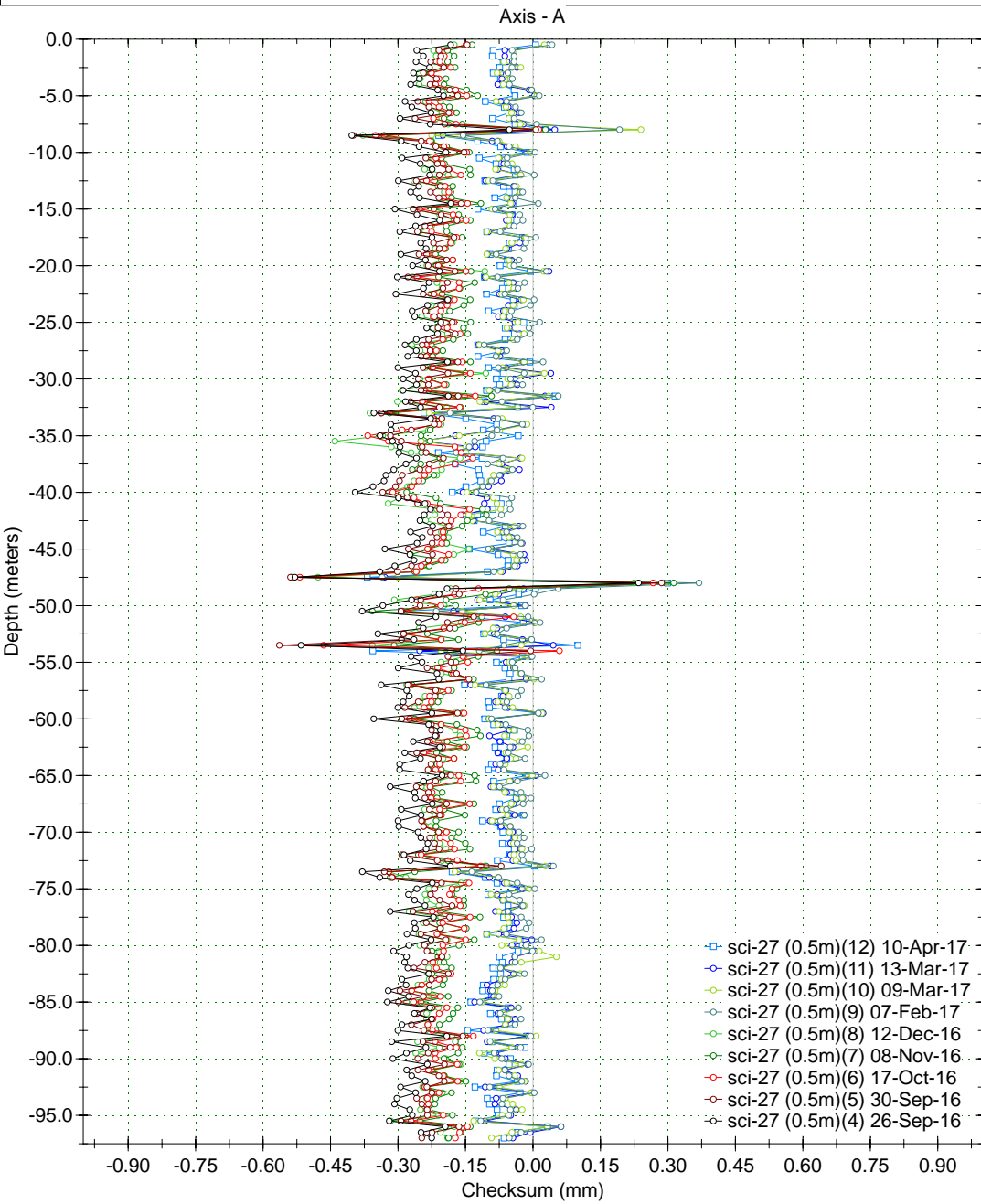
Borehole : sci-27
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 97.0 meters
 A+ Groove Azimuth :
 Base Reading : 2016 Sep 26 10:12
 Applied Azimuth : 0.0 degrees



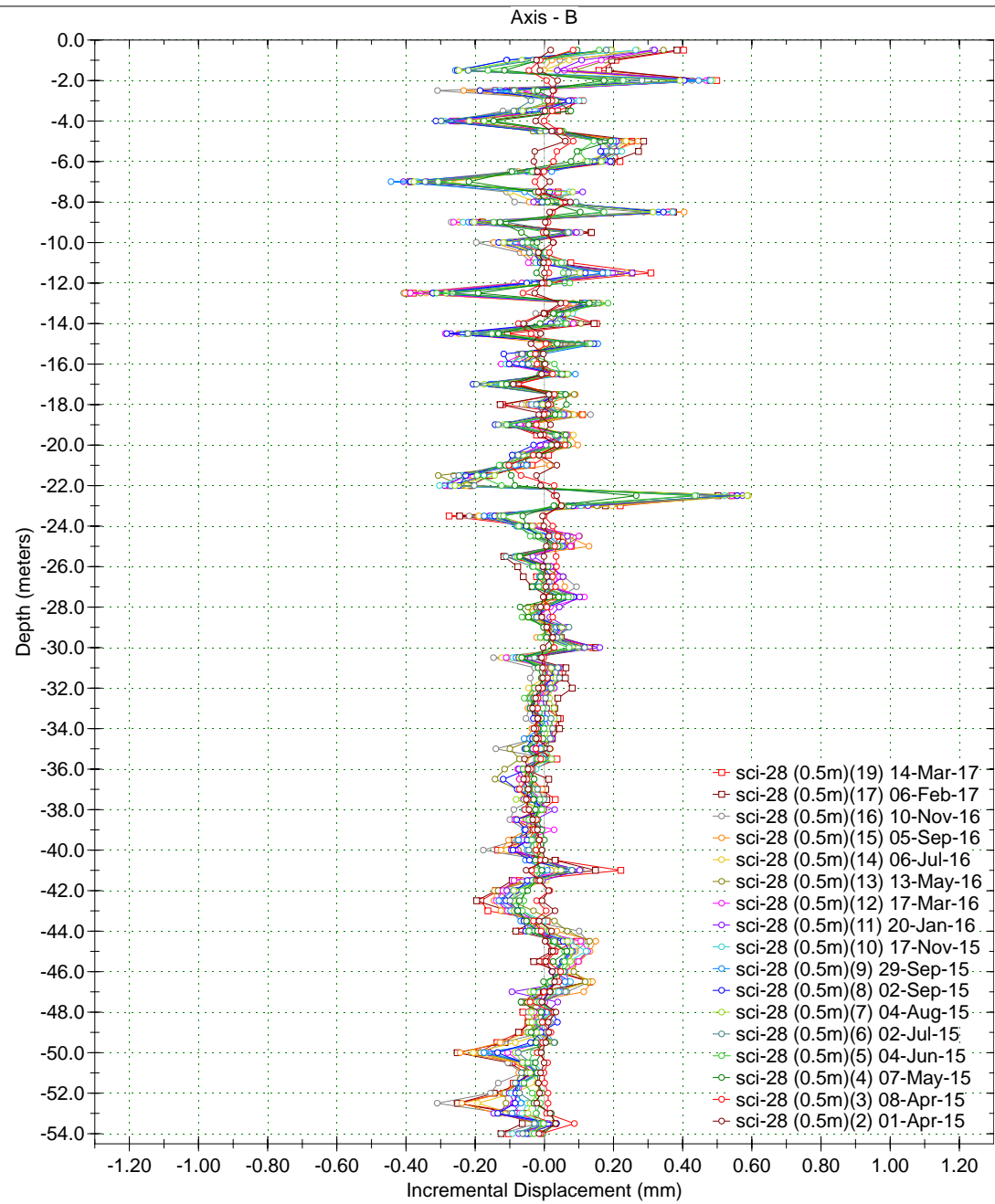
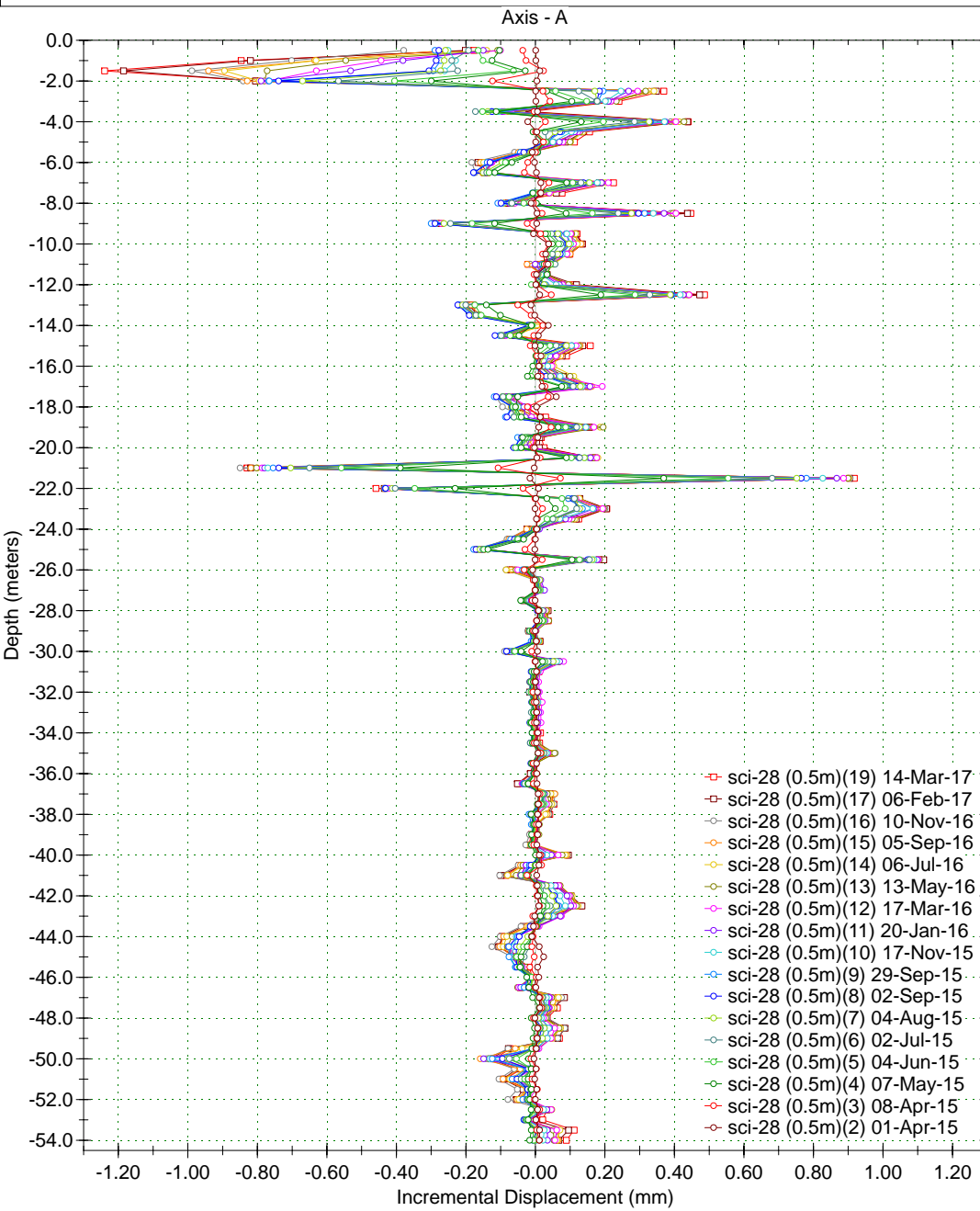
Borehole : sci-27
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 97.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Sep 26 10:12
Applied Azimuth : 0.0 degrees



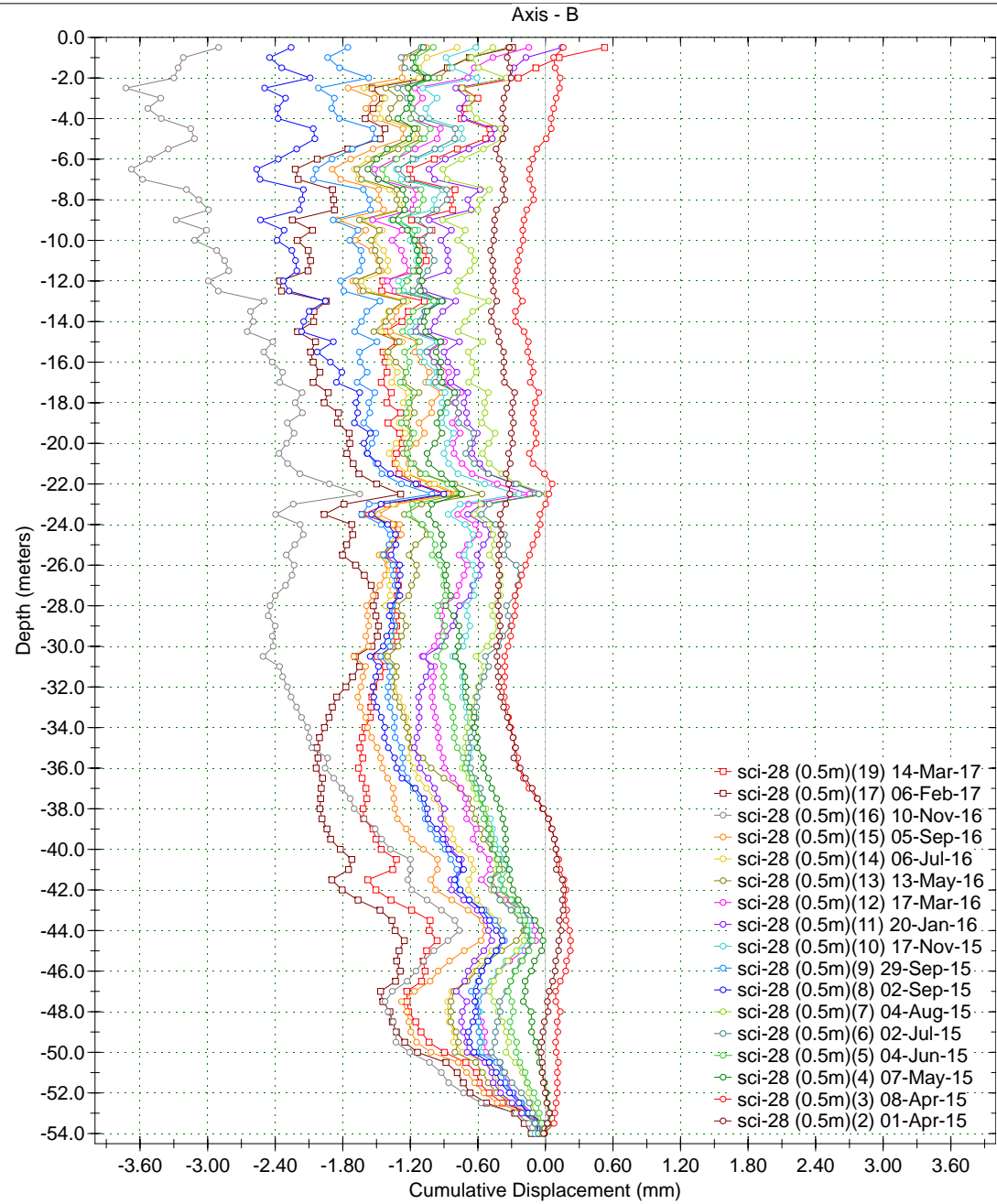
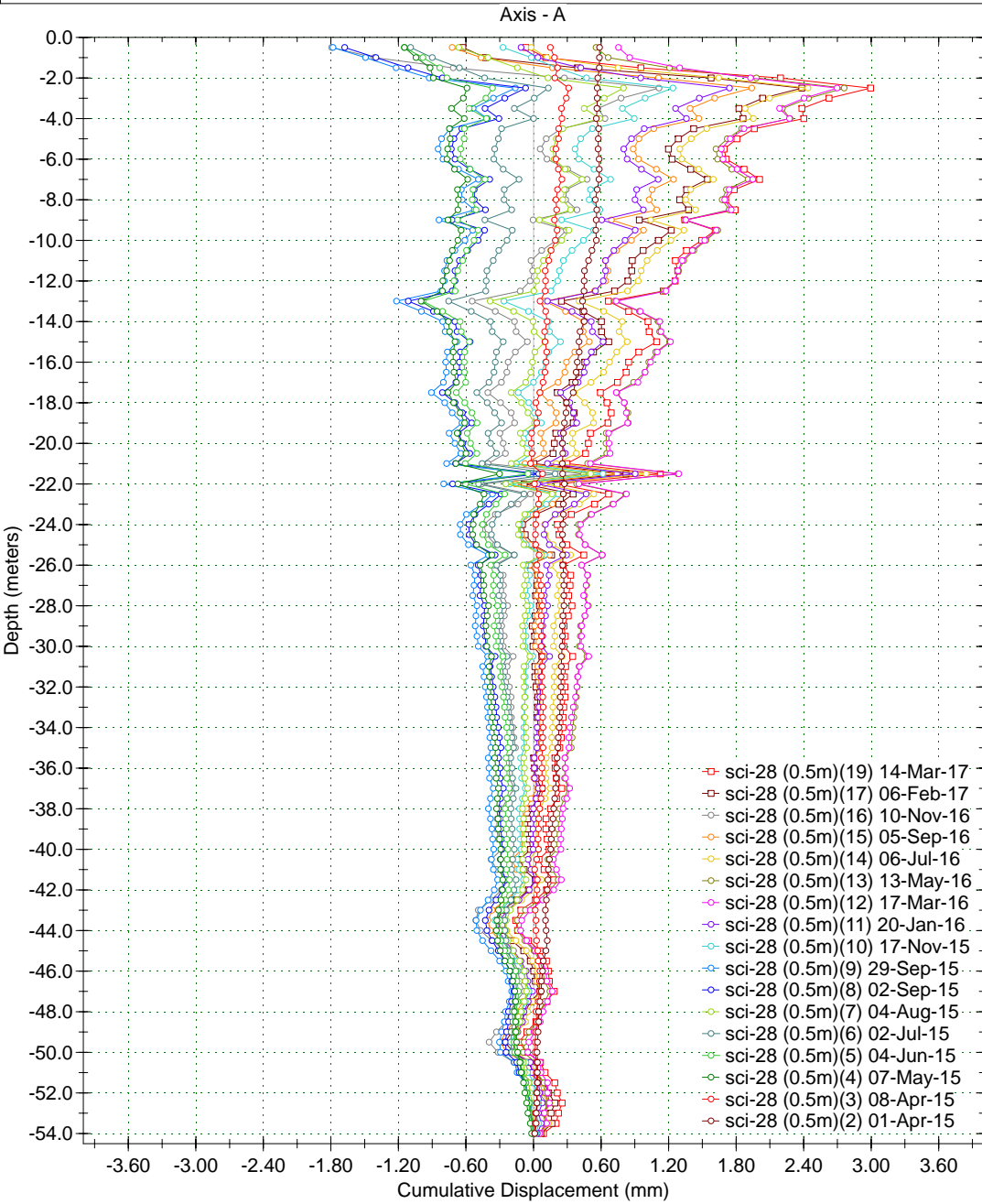
Borehole : sci-28
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 54.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Apr 01 16:44
 Applied Azimuth : 0.0 degrees



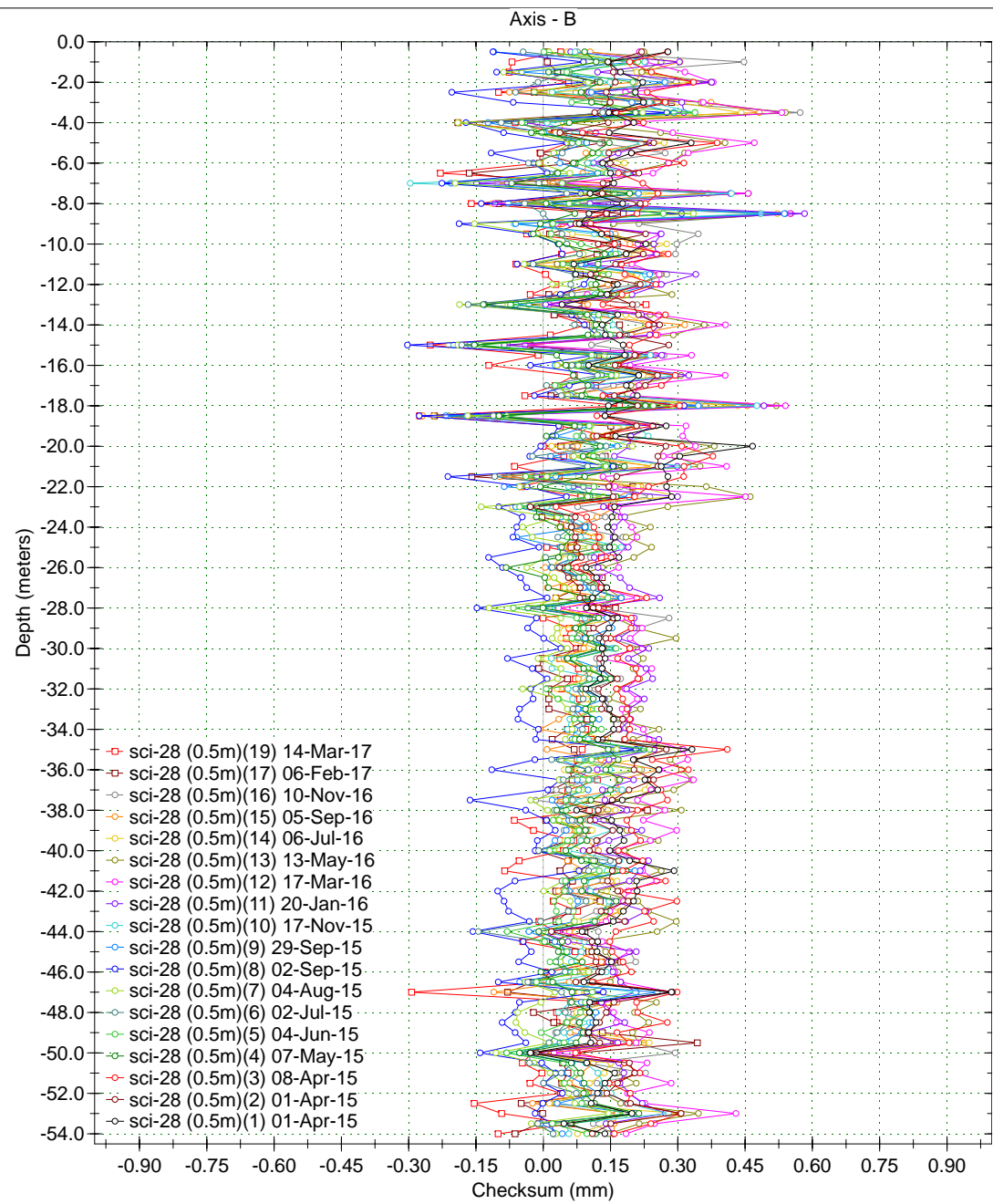
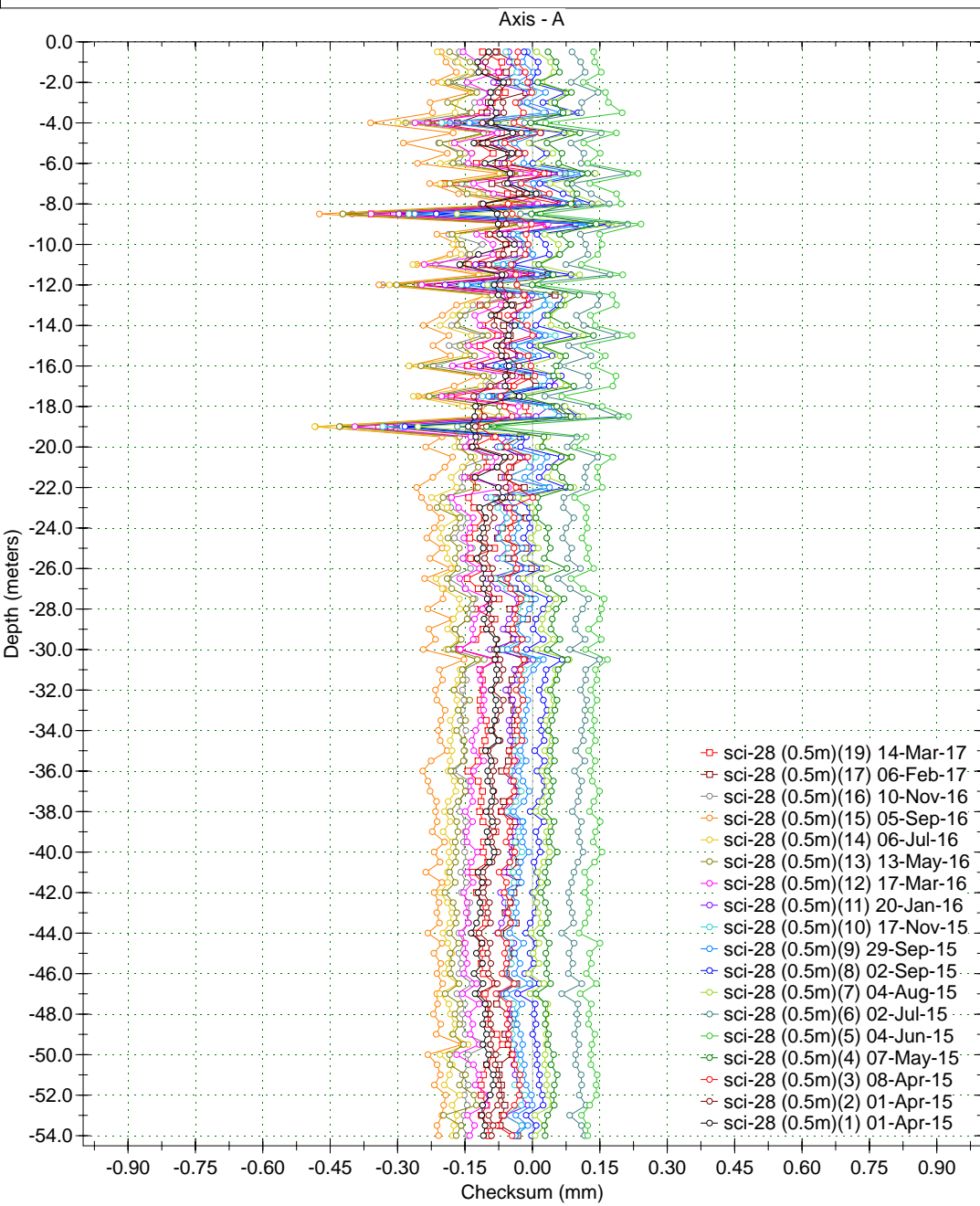
Borehole : sci-28
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 54.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Apr 01 16:44
Applied Azimuth : 0.0 degrees



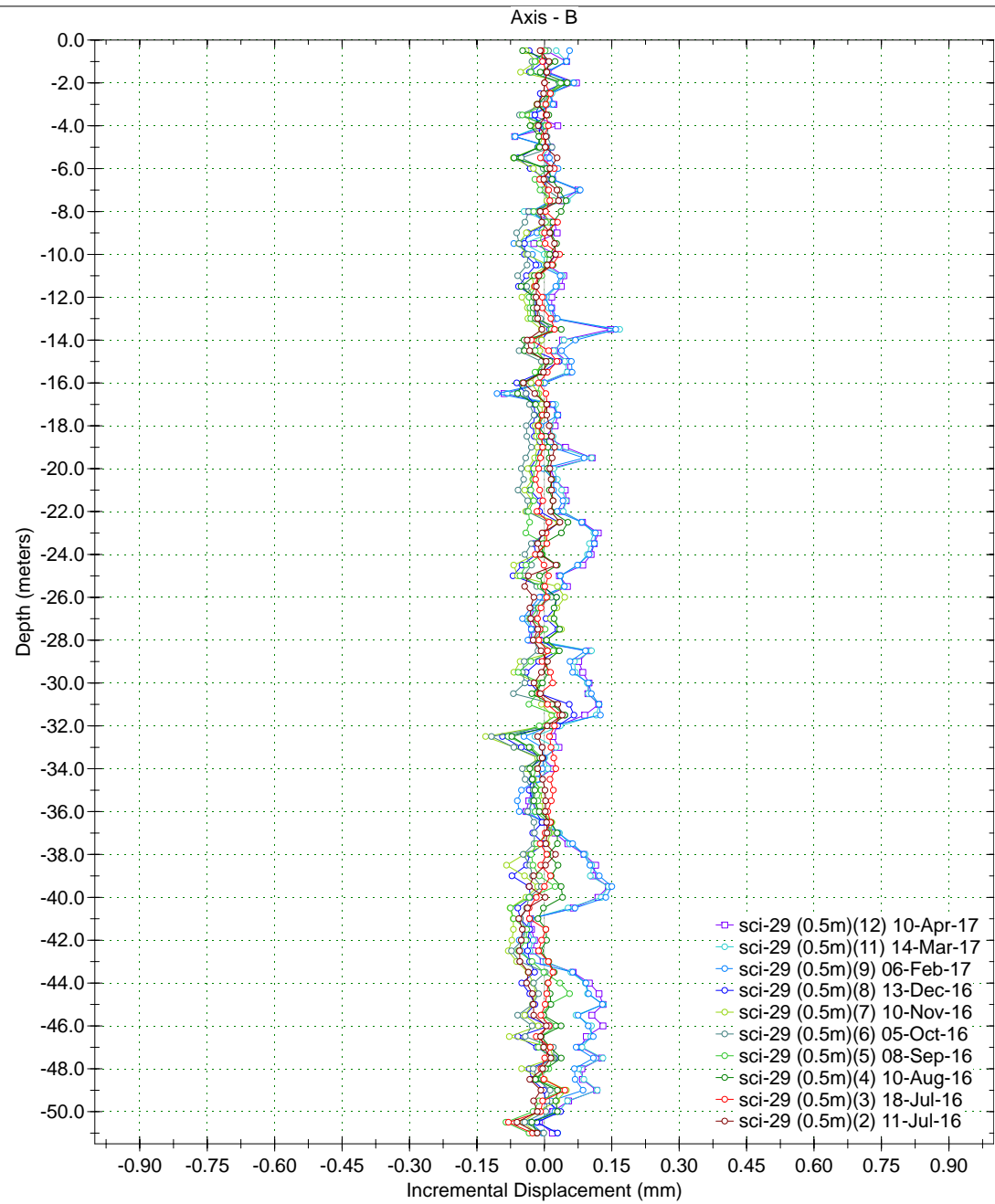
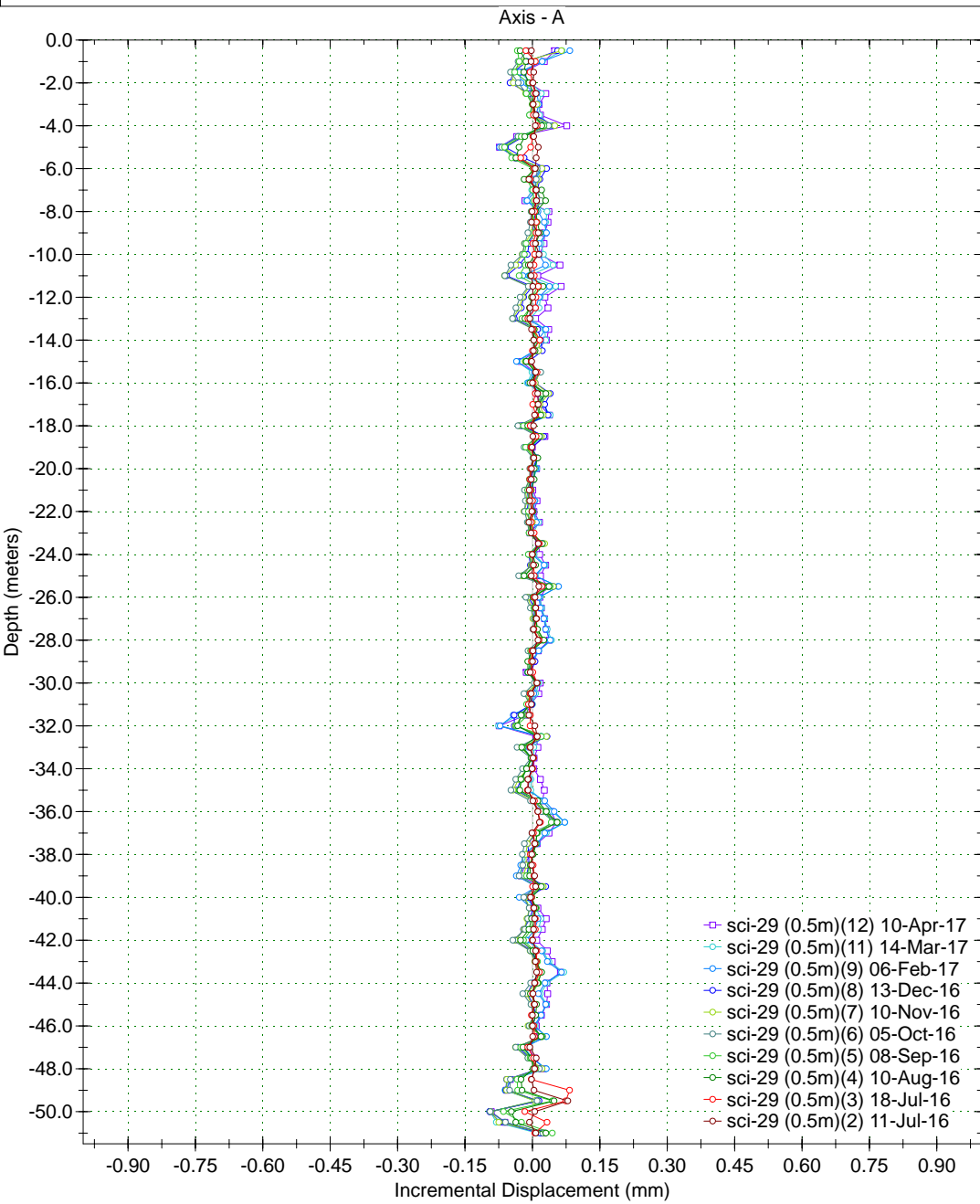
Borehole : sci-28
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 54.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Apr 01 16:44
Applied Azimuth : 0.0 degrees



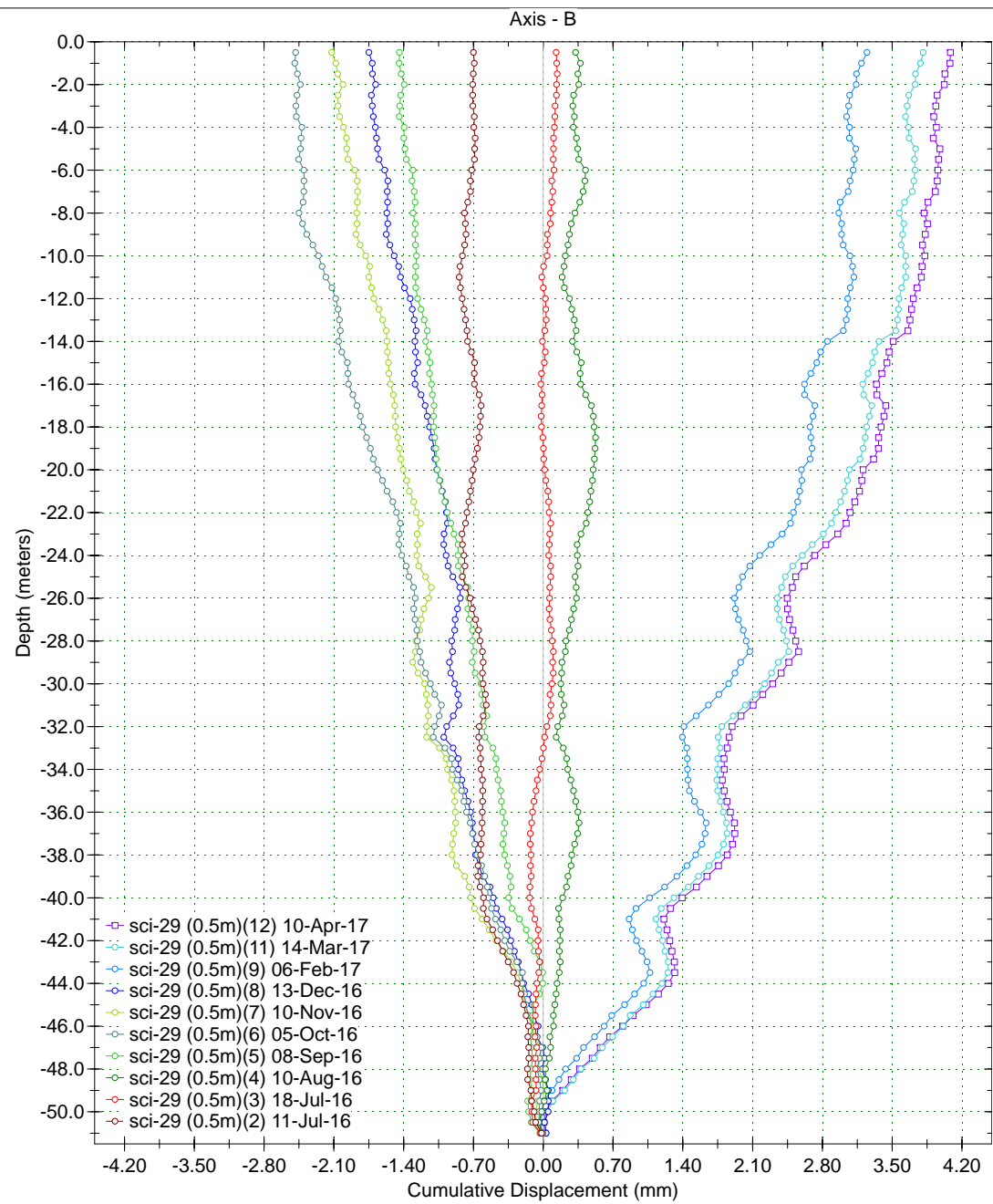
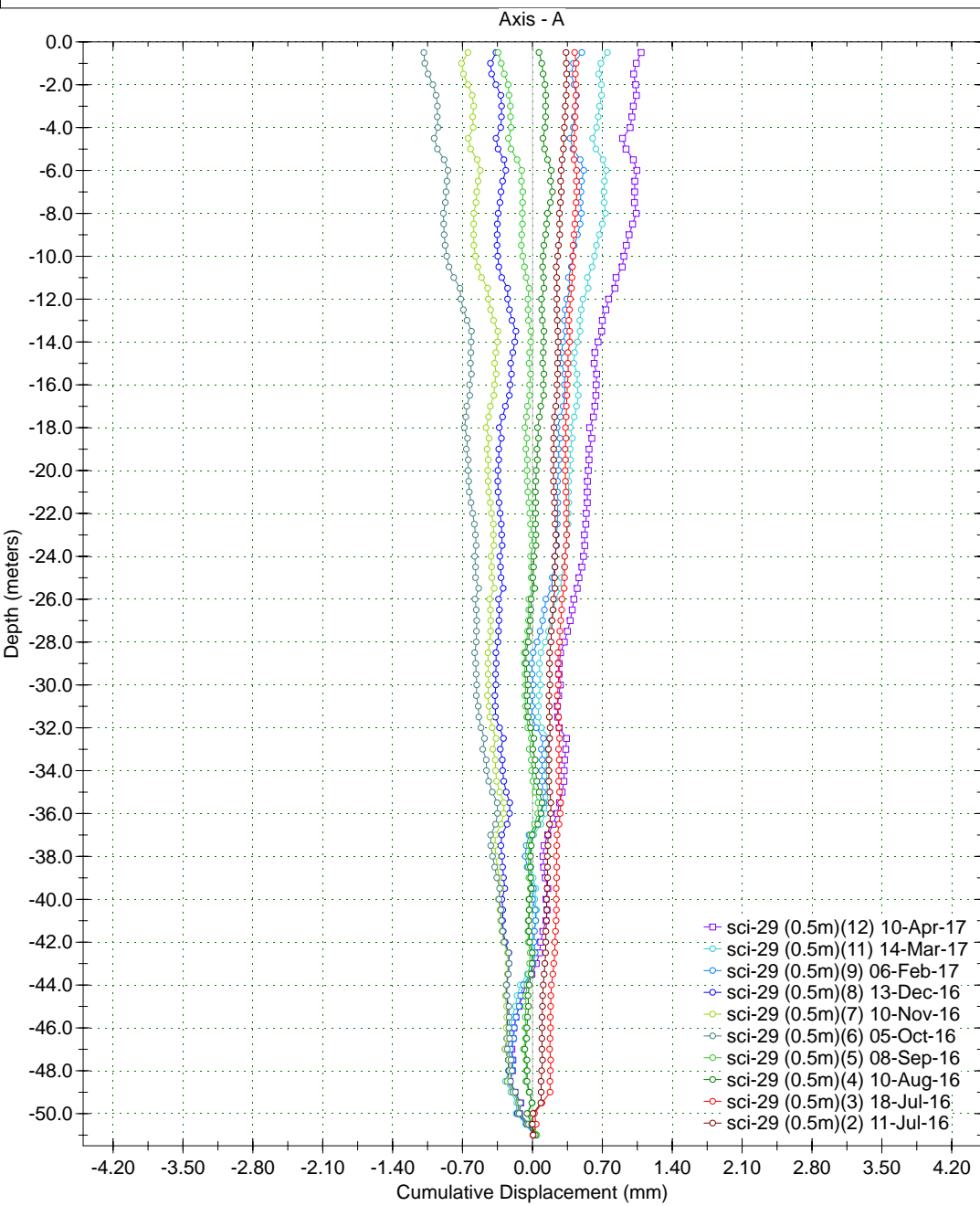
Borehole : sci-29
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 51.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Jul 11 10:40
Applied Azimuth : 0.0 degrees



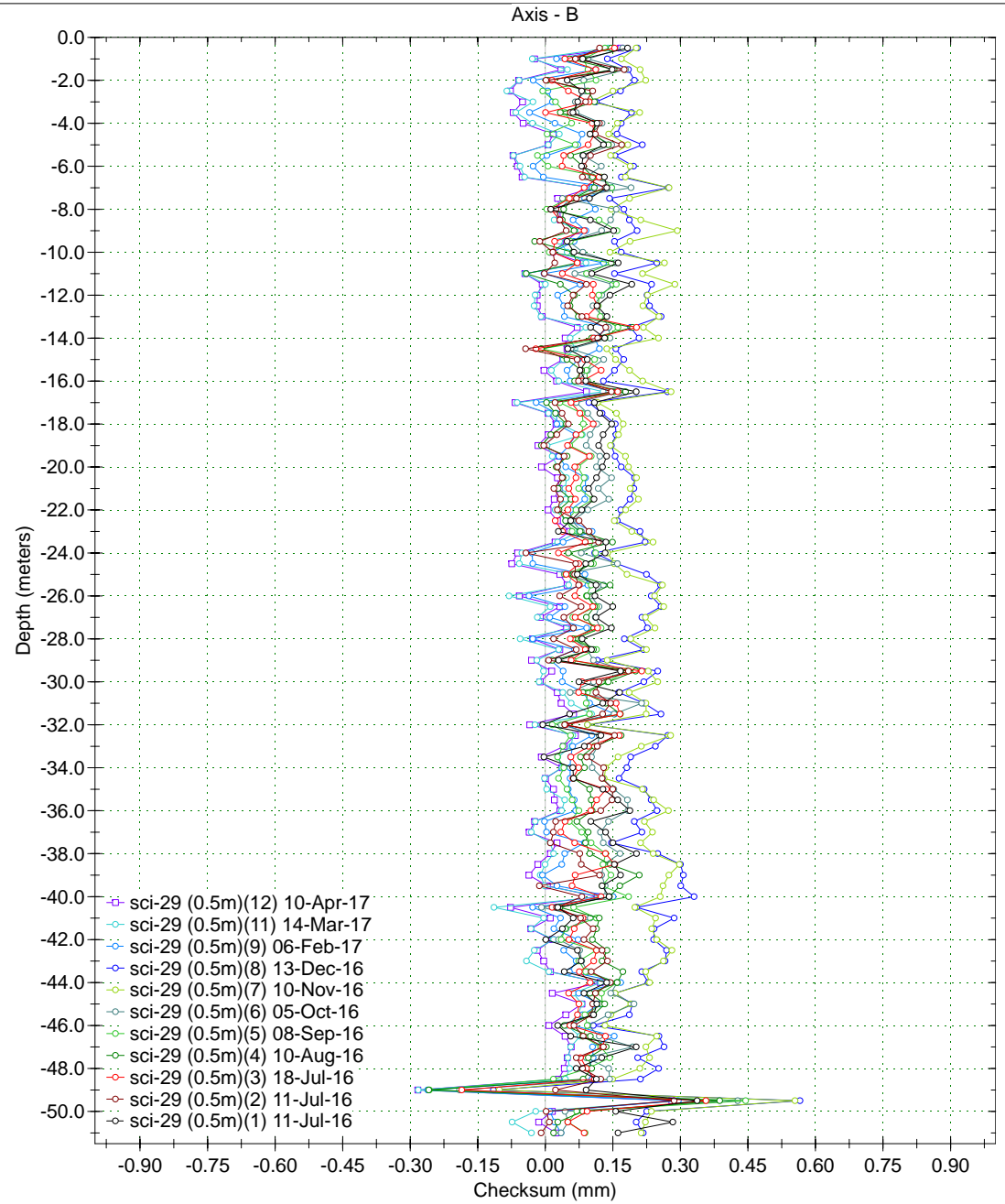
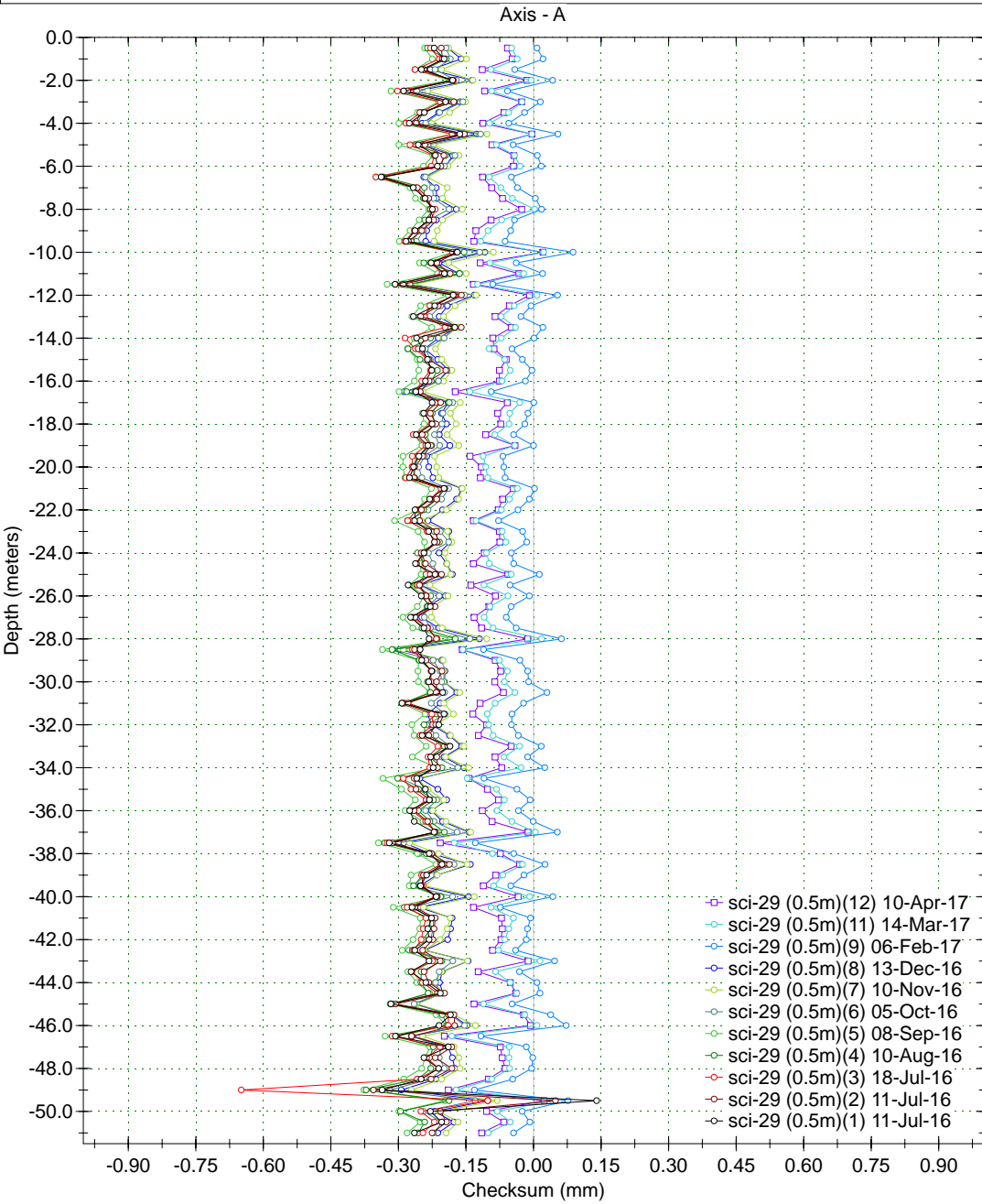
Borehole : sci-29
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 51.0 meters
 A+ Groove Azimuth :
 Base Reading : 2016 Jul 11 10:40
 Applied Azimuth : 0.0 degrees



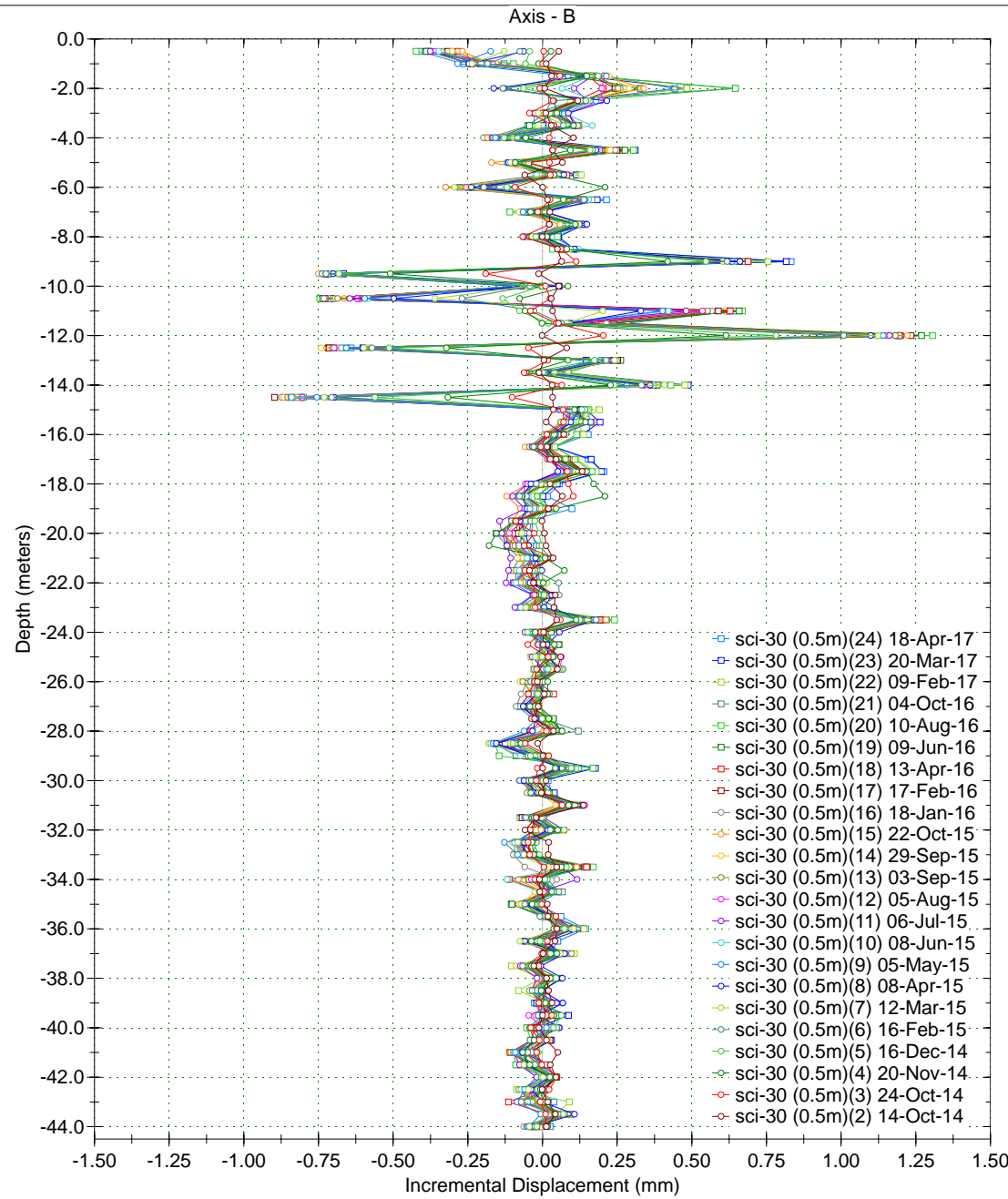
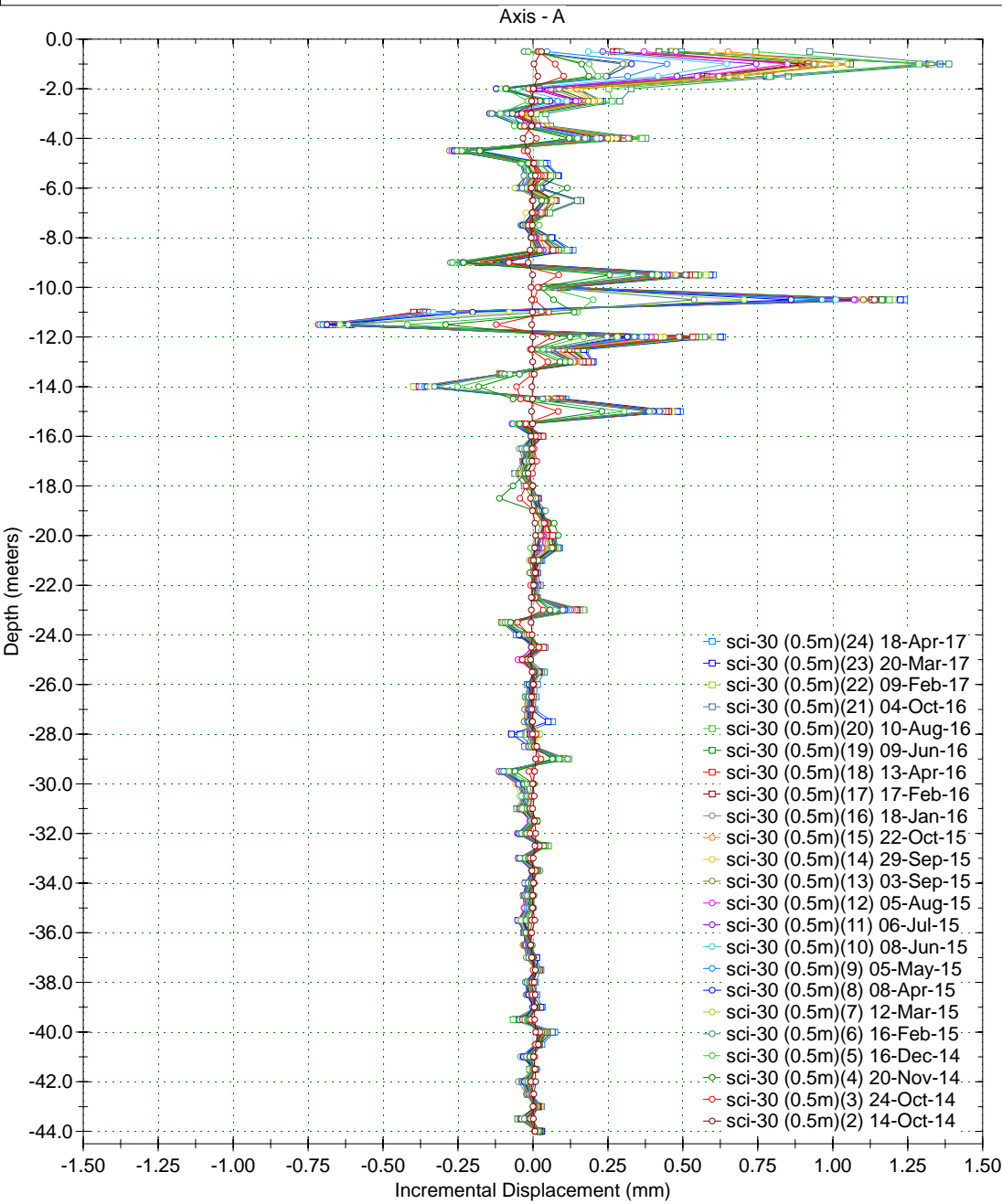
Borehole : sci-29
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 51.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Jul 11 10:40
Applied Azimuth : 0.0 degrees



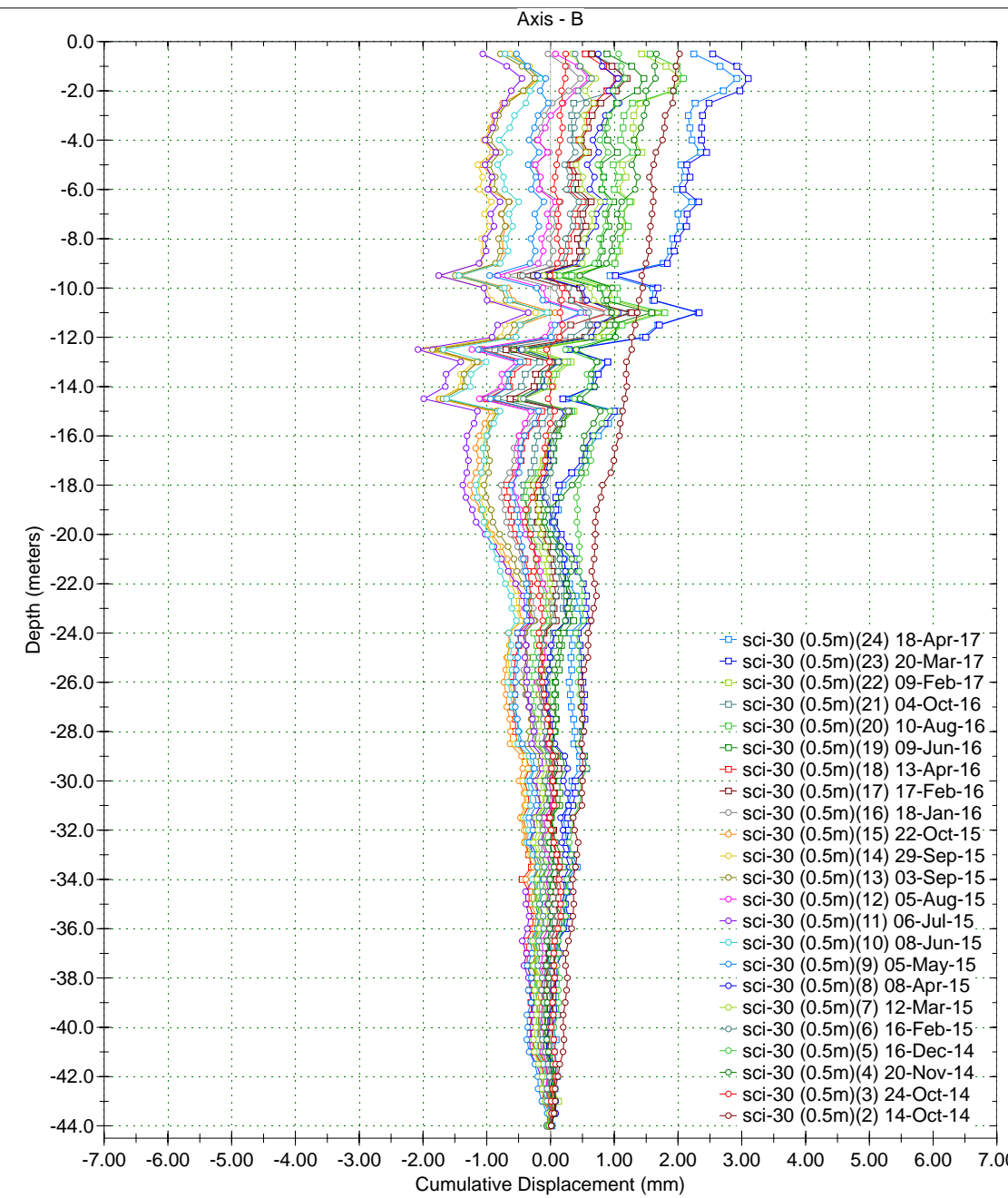
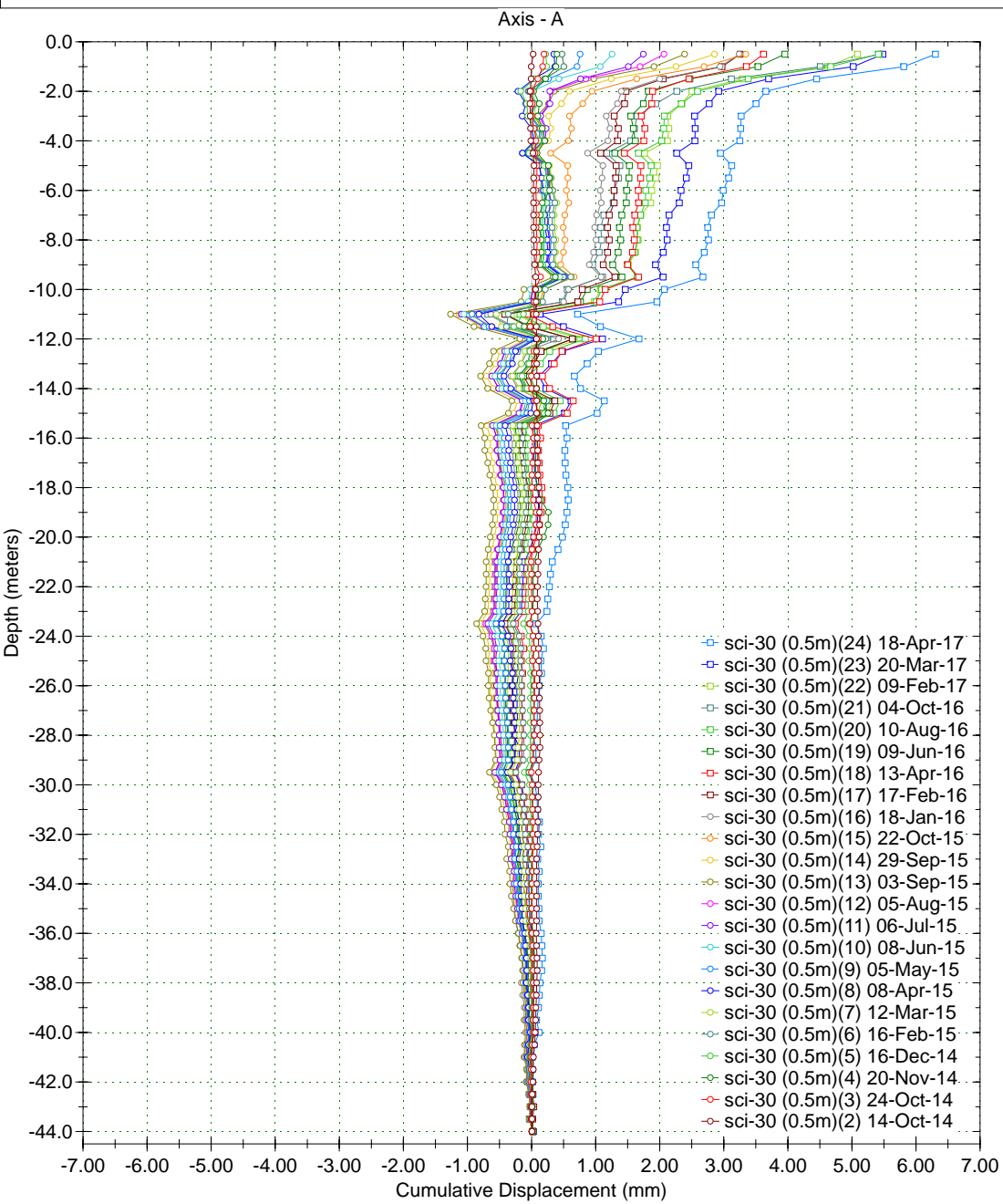
Borehole : sci-30
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 44.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Oct 14 12:57
 Applied Azimuth : 0.0 degrees



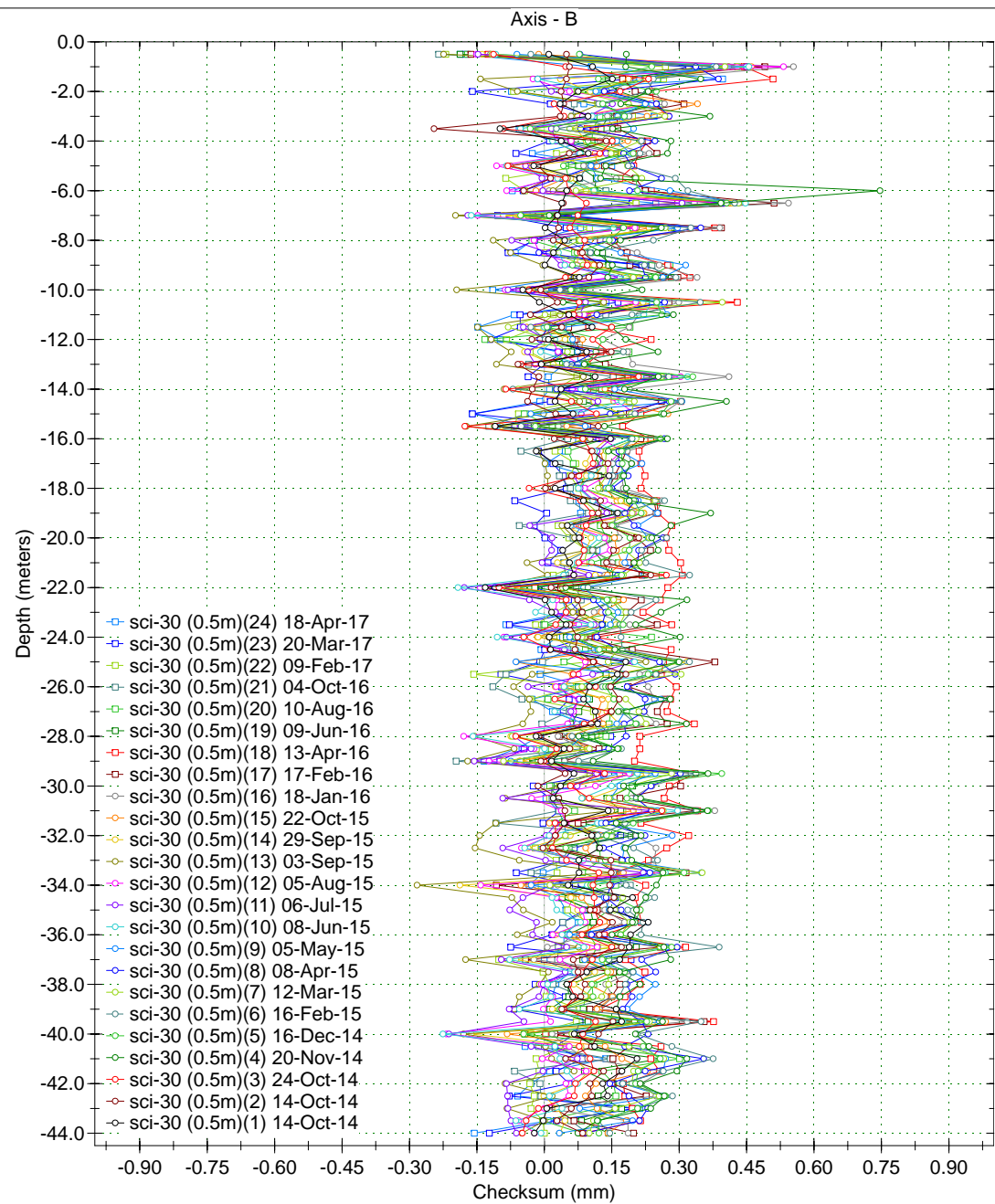
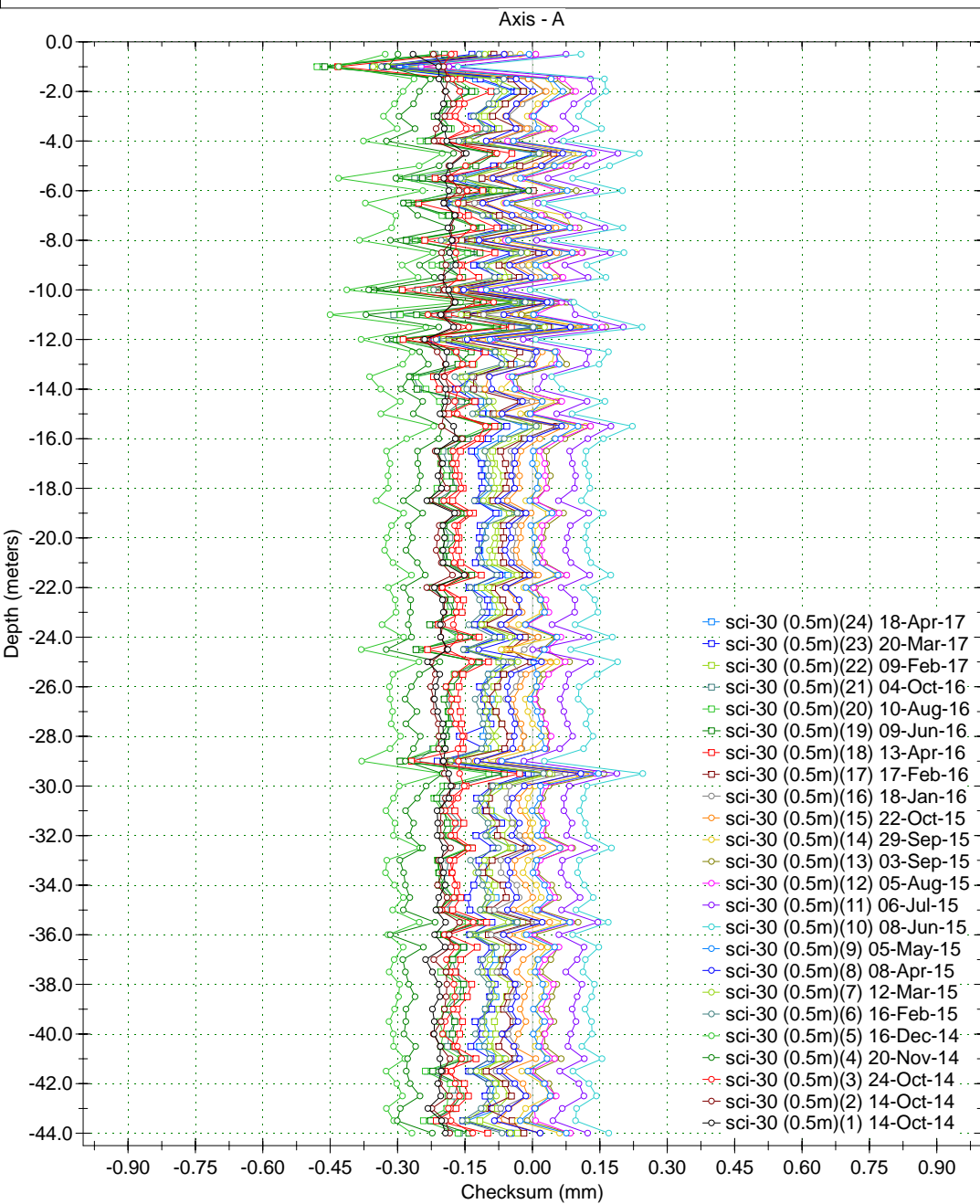
Borehole : sci-30
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 44.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Oct 14 12:57
 Applied Azimuth : 0.0 degrees



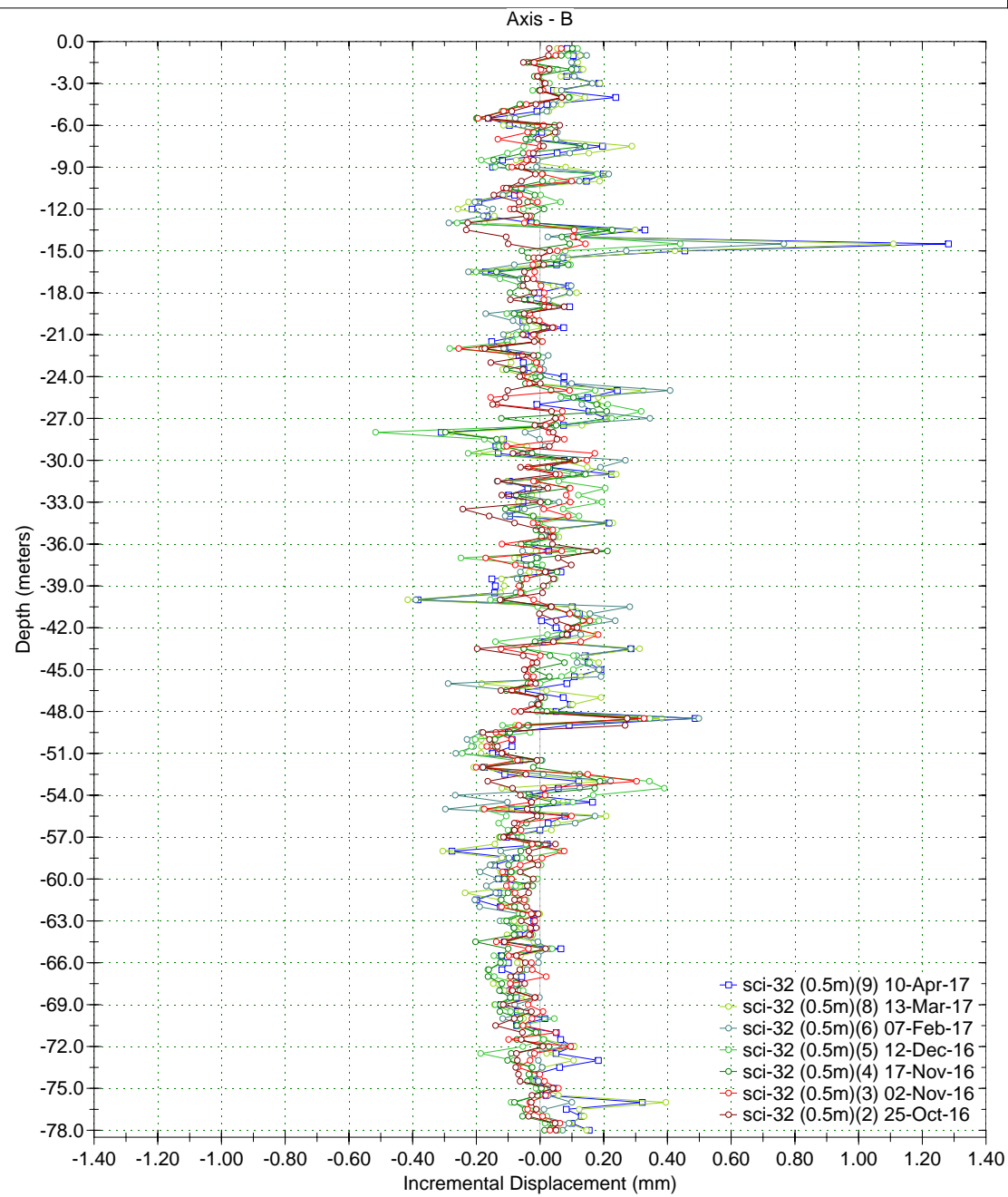
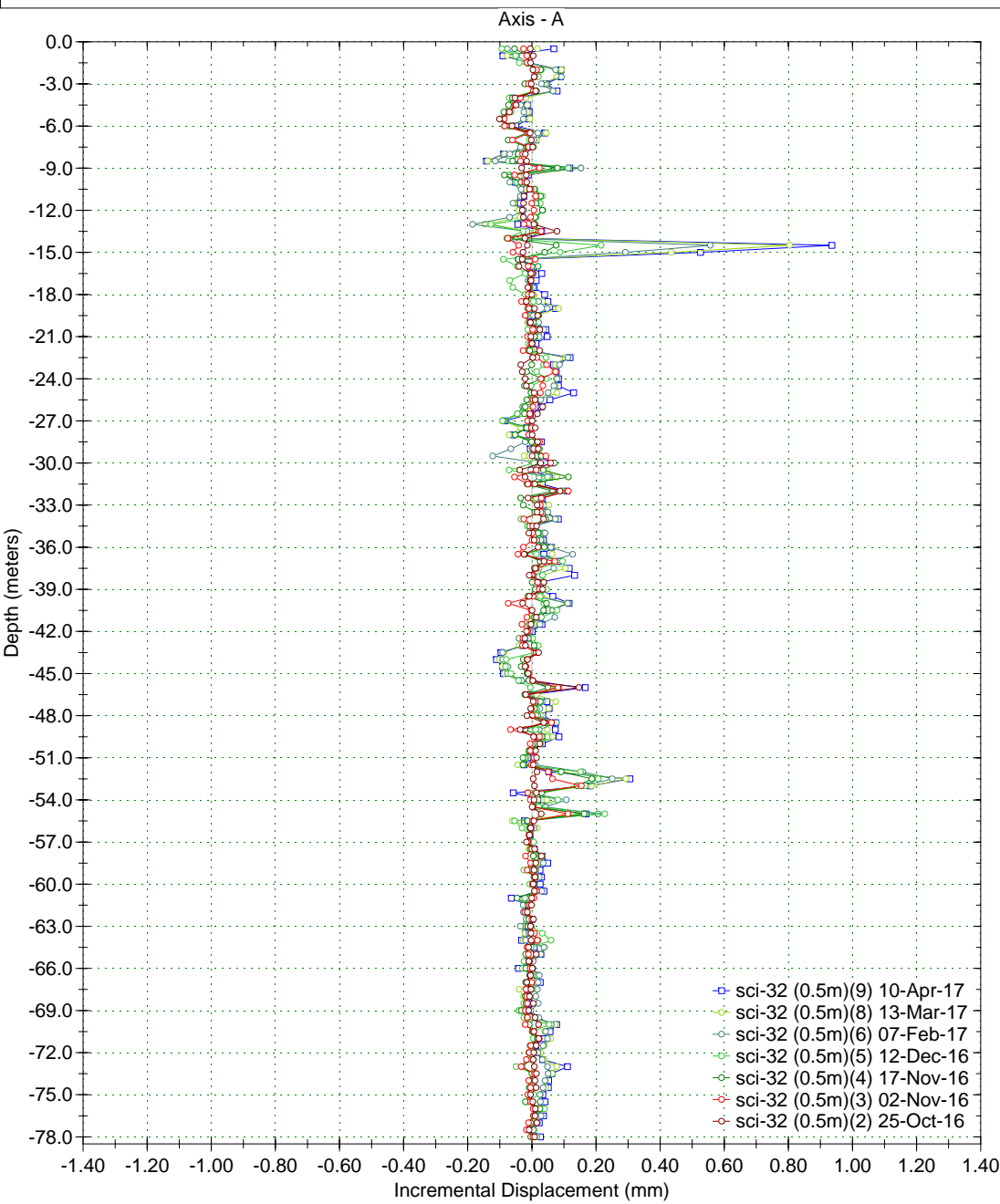
Borehole : sci-30
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 44.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Oct 14 12:57
Applied Azimuth : 0.0 degrees



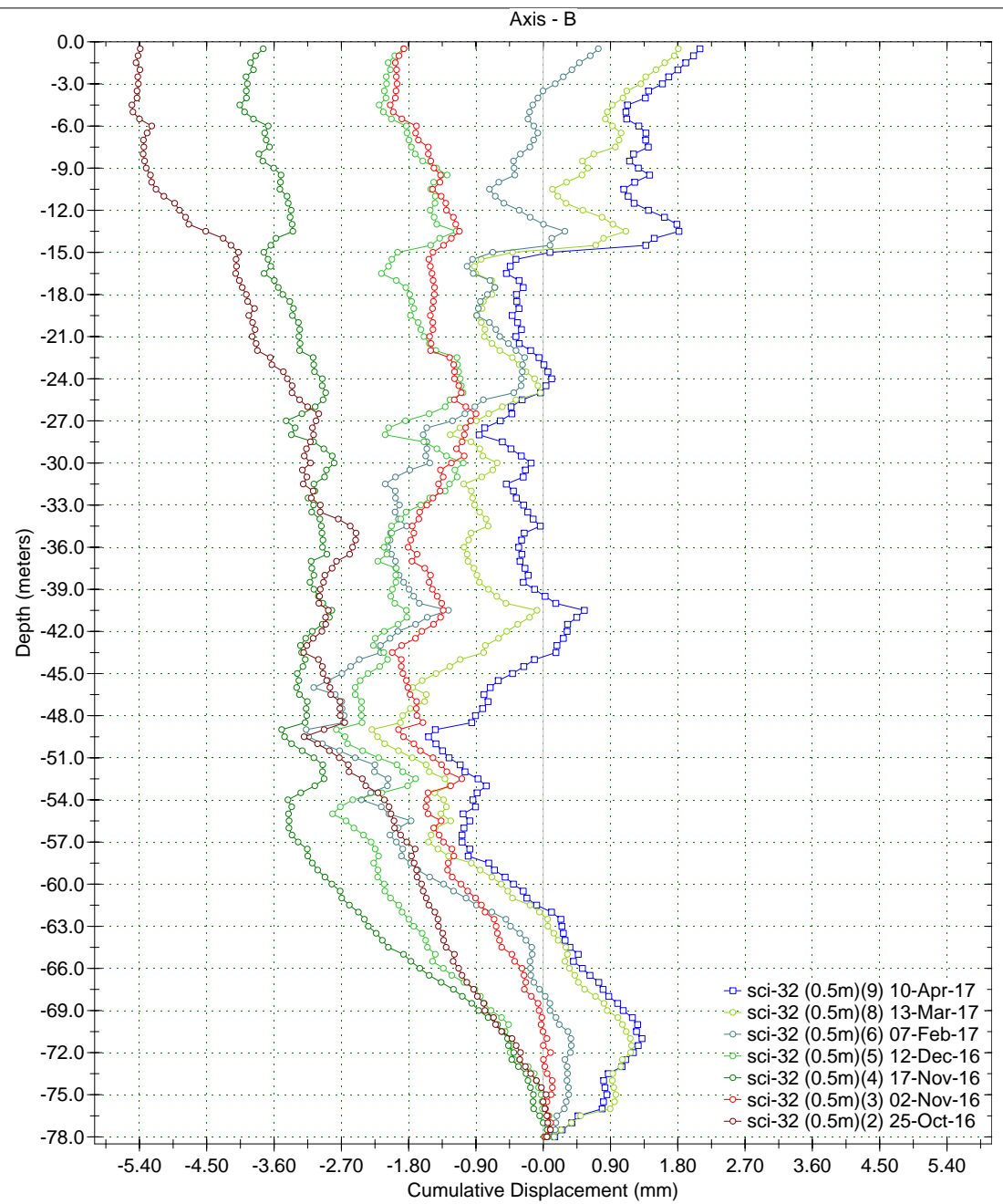
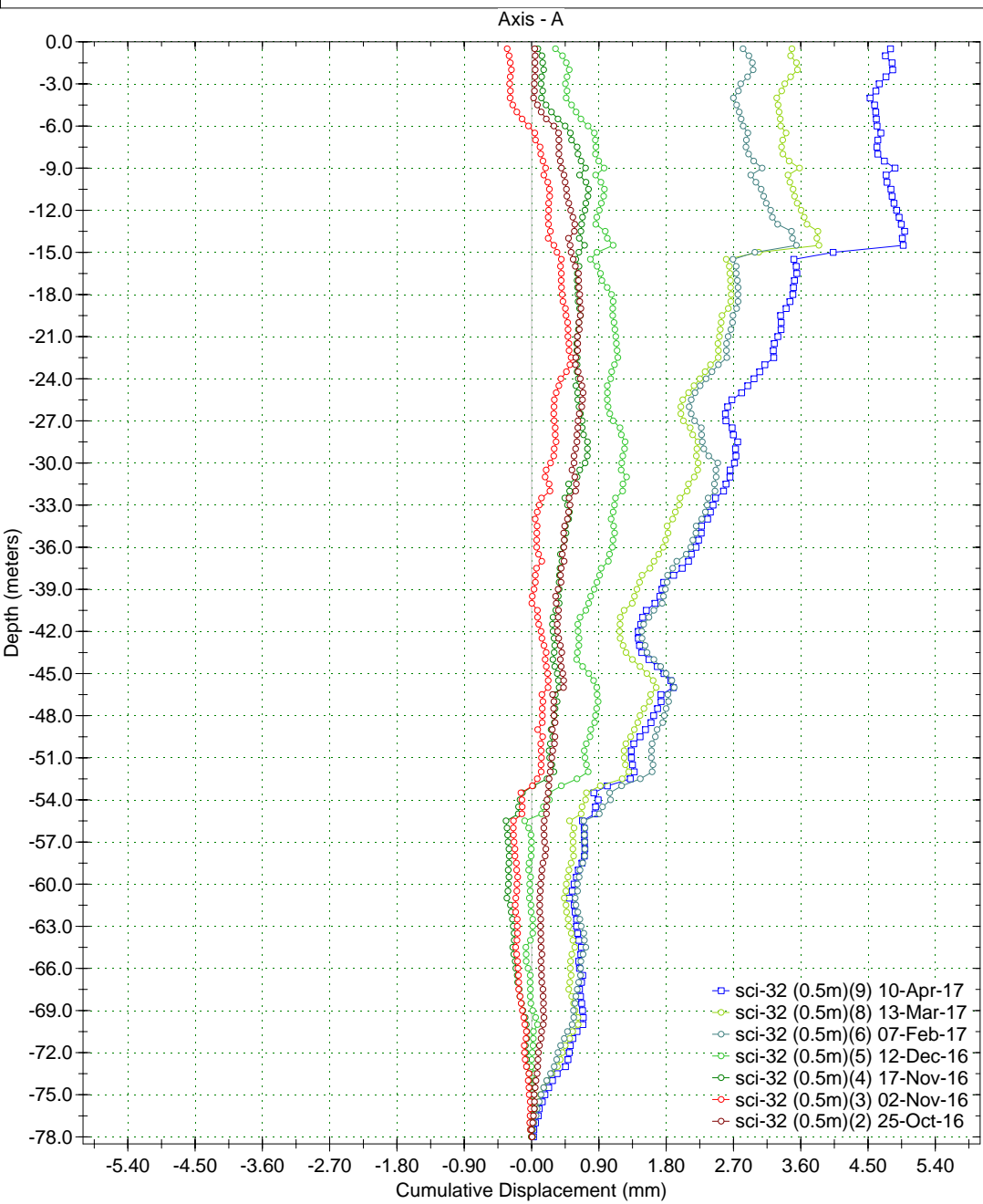
Borehole : sci-32
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 78.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Oct 25 11:54
Applied Azimuth : 0.0 degrees



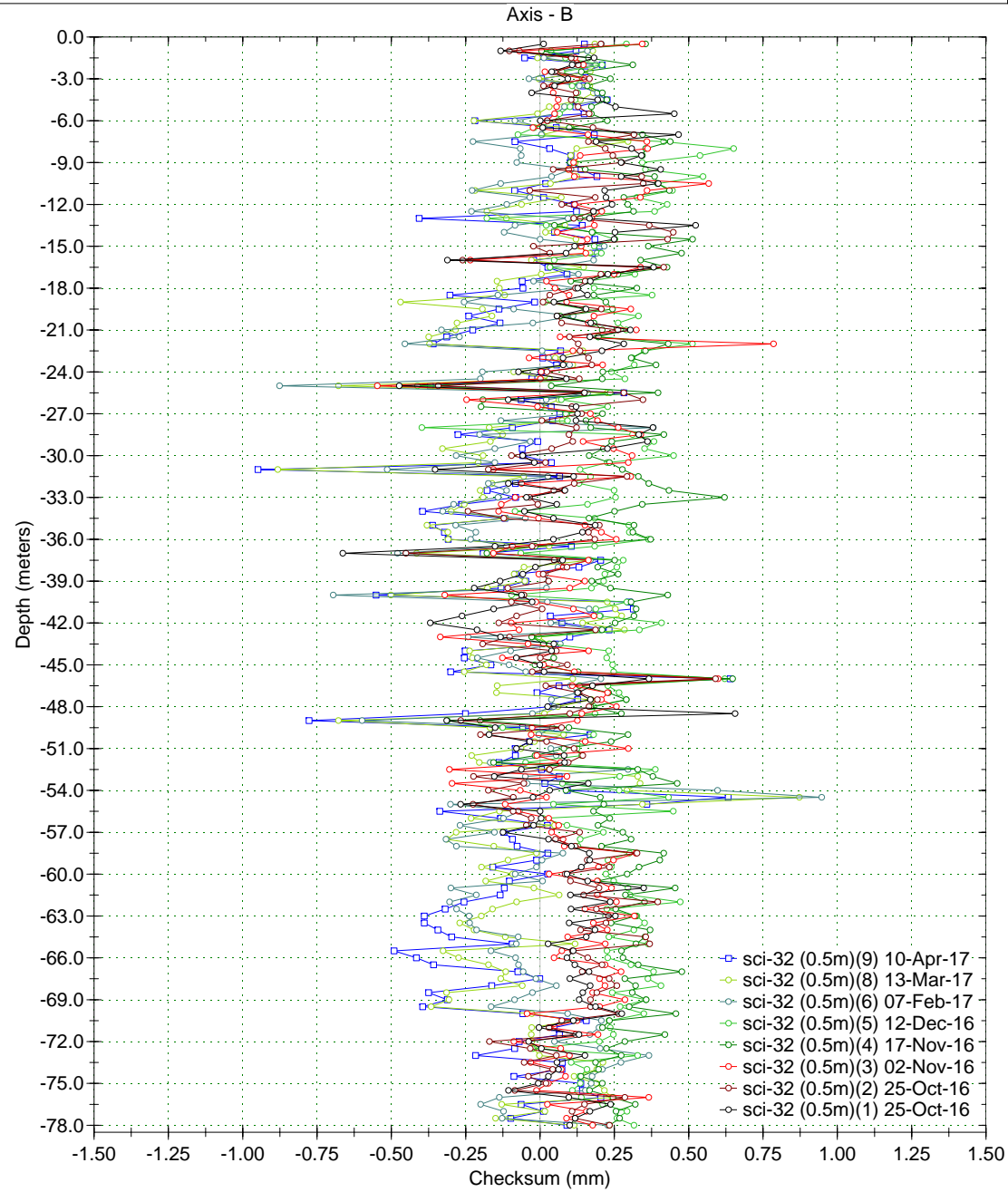
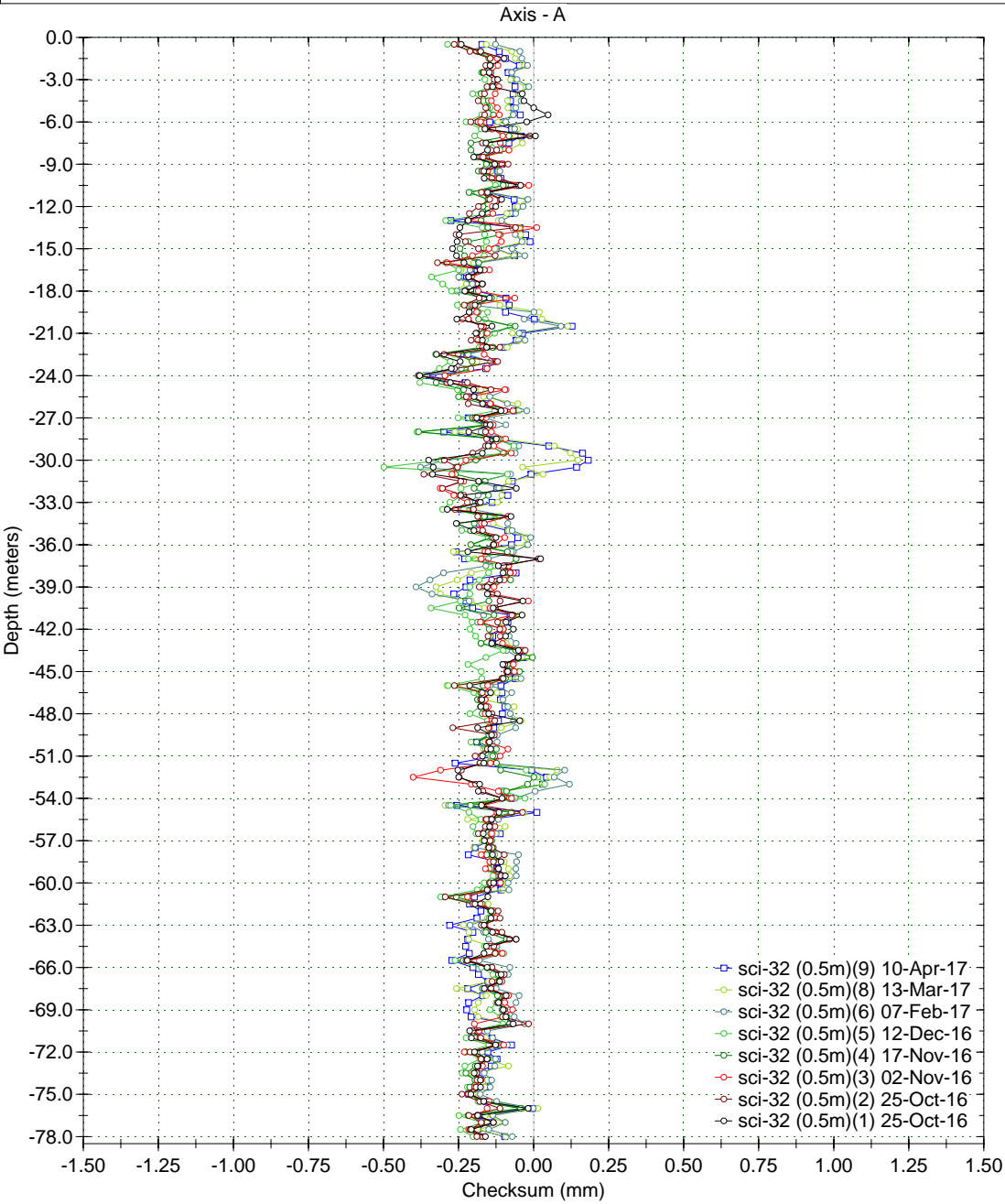
Borehole : sci-32
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 78.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Oct 25 11:54
Applied Azimuth : 0.0 degrees



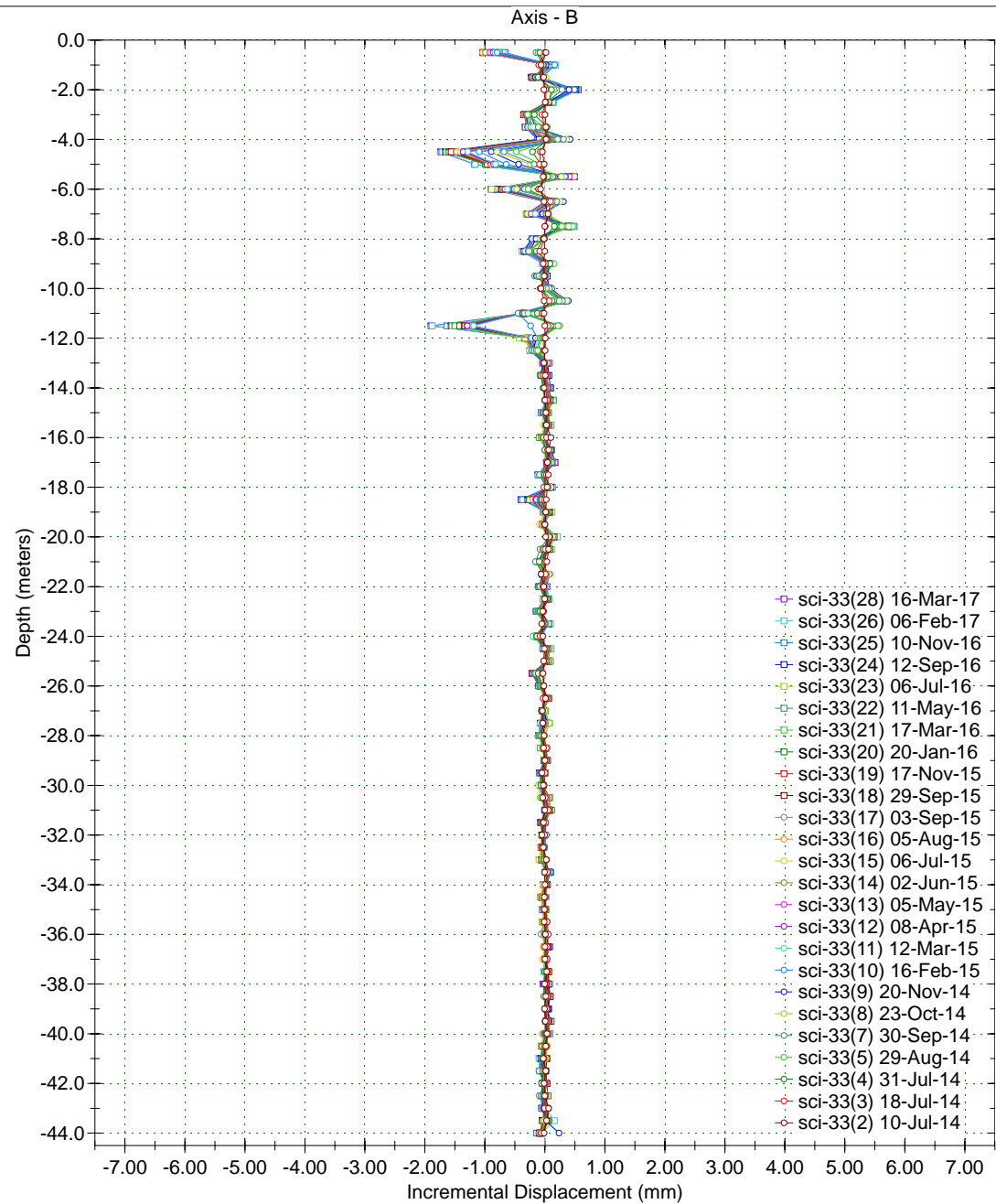
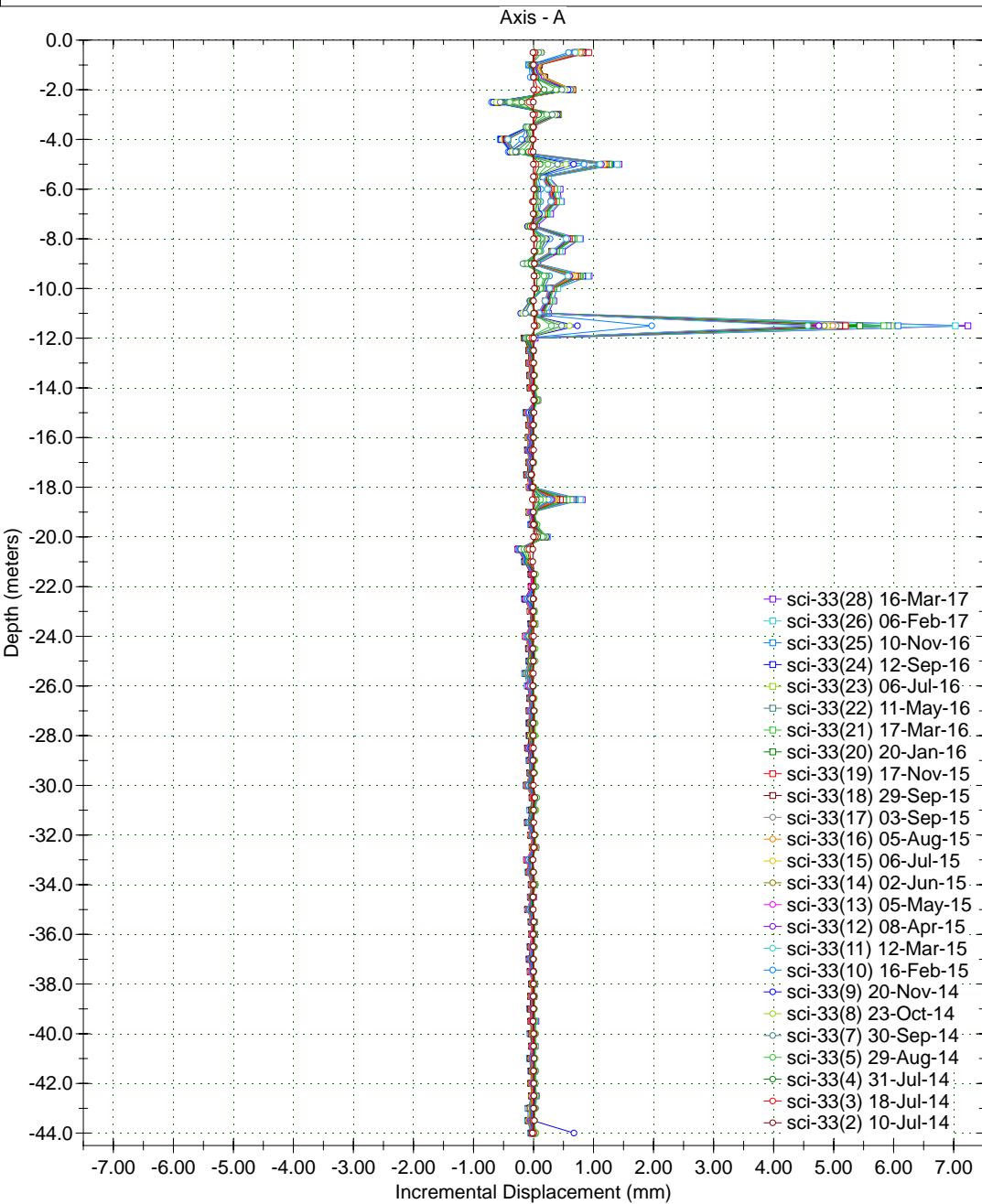
Borehole : sci-32
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 78.0 meters
A+ Groove Azimuth :
Base Reading : 2016 Oct 25 11:54
Applied Azimuth : 0.0 degrees



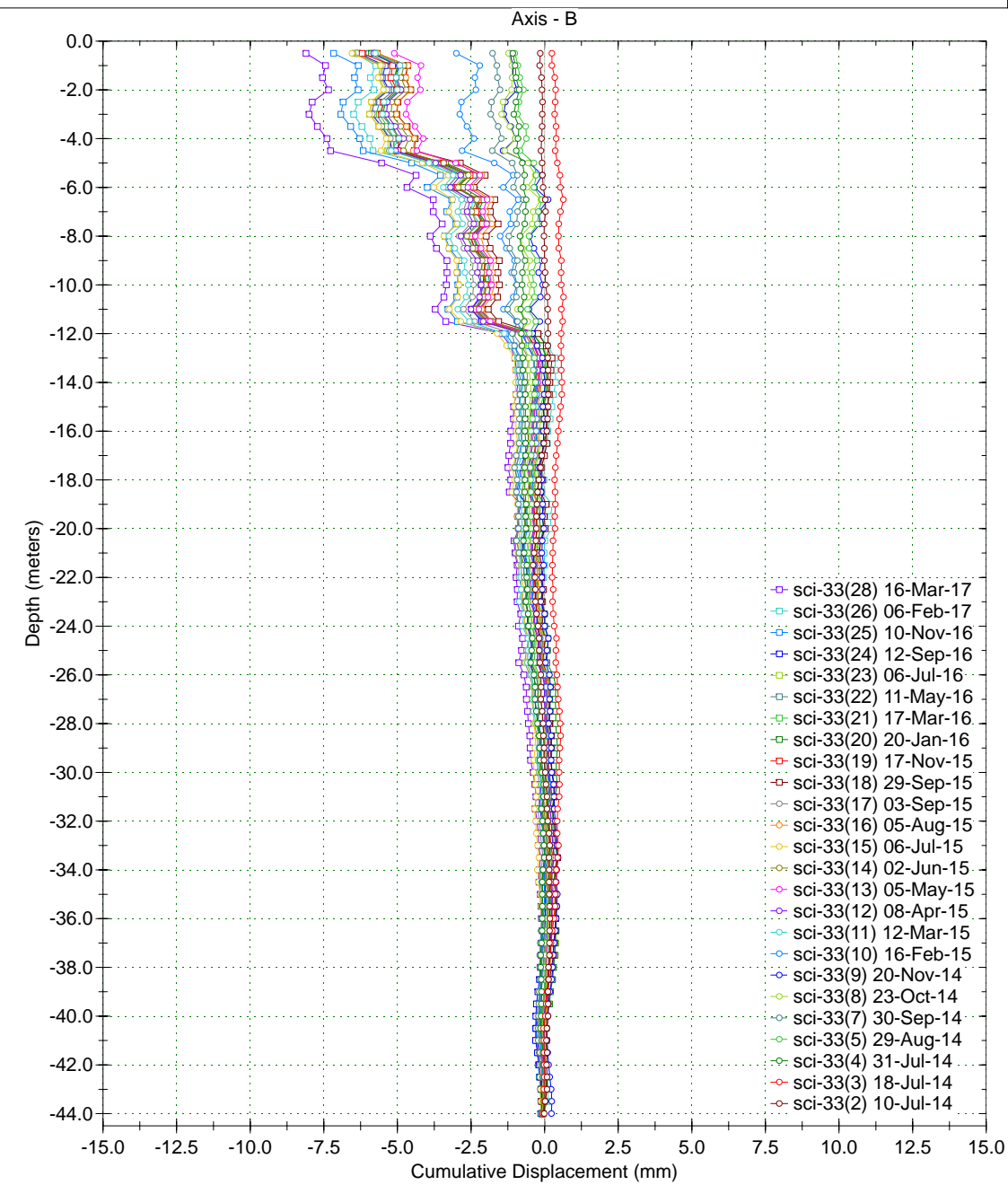
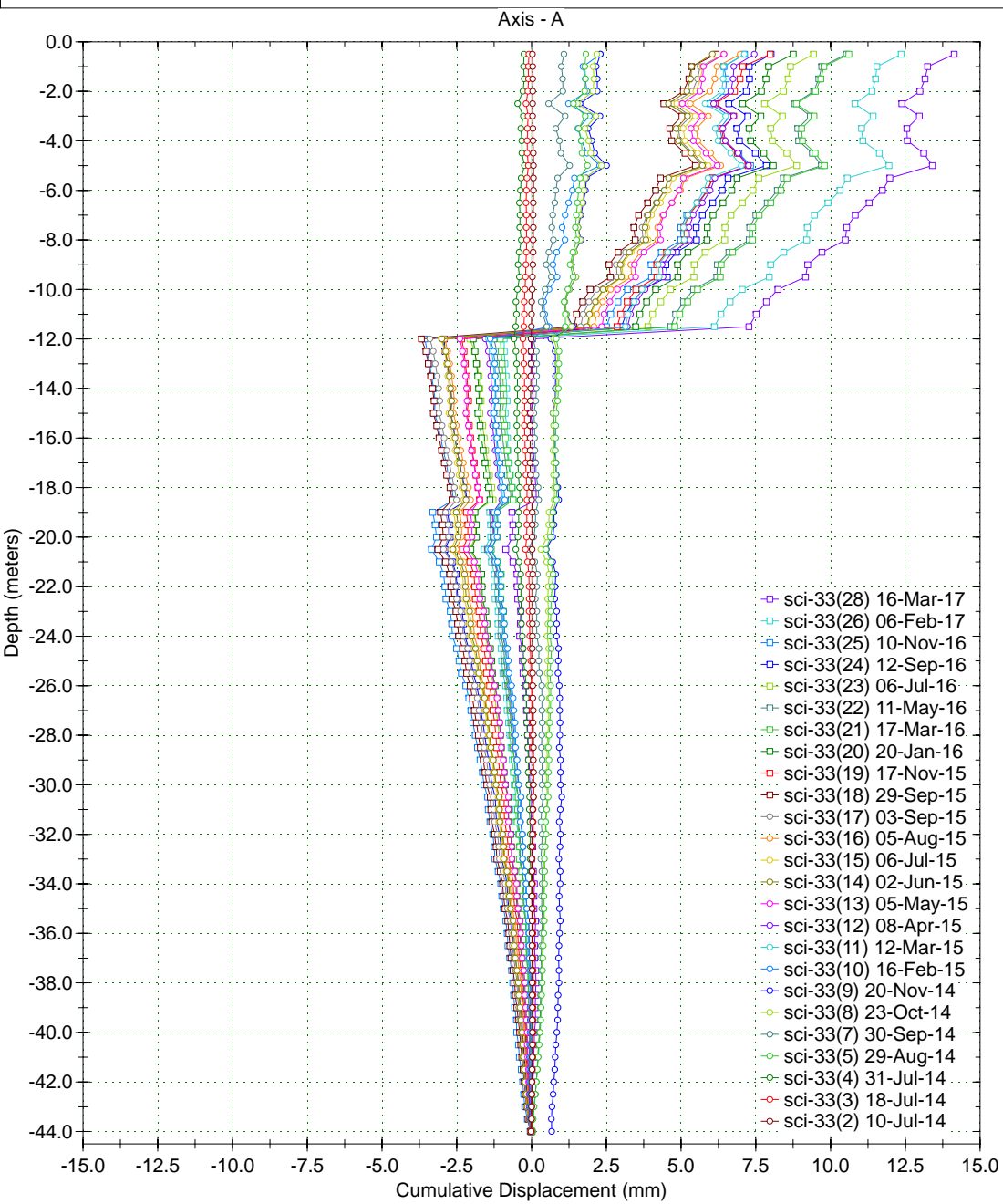
Borehole : sci-33
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 44.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jul 10 11:18
Applied Azimuth : 0.0 degrees



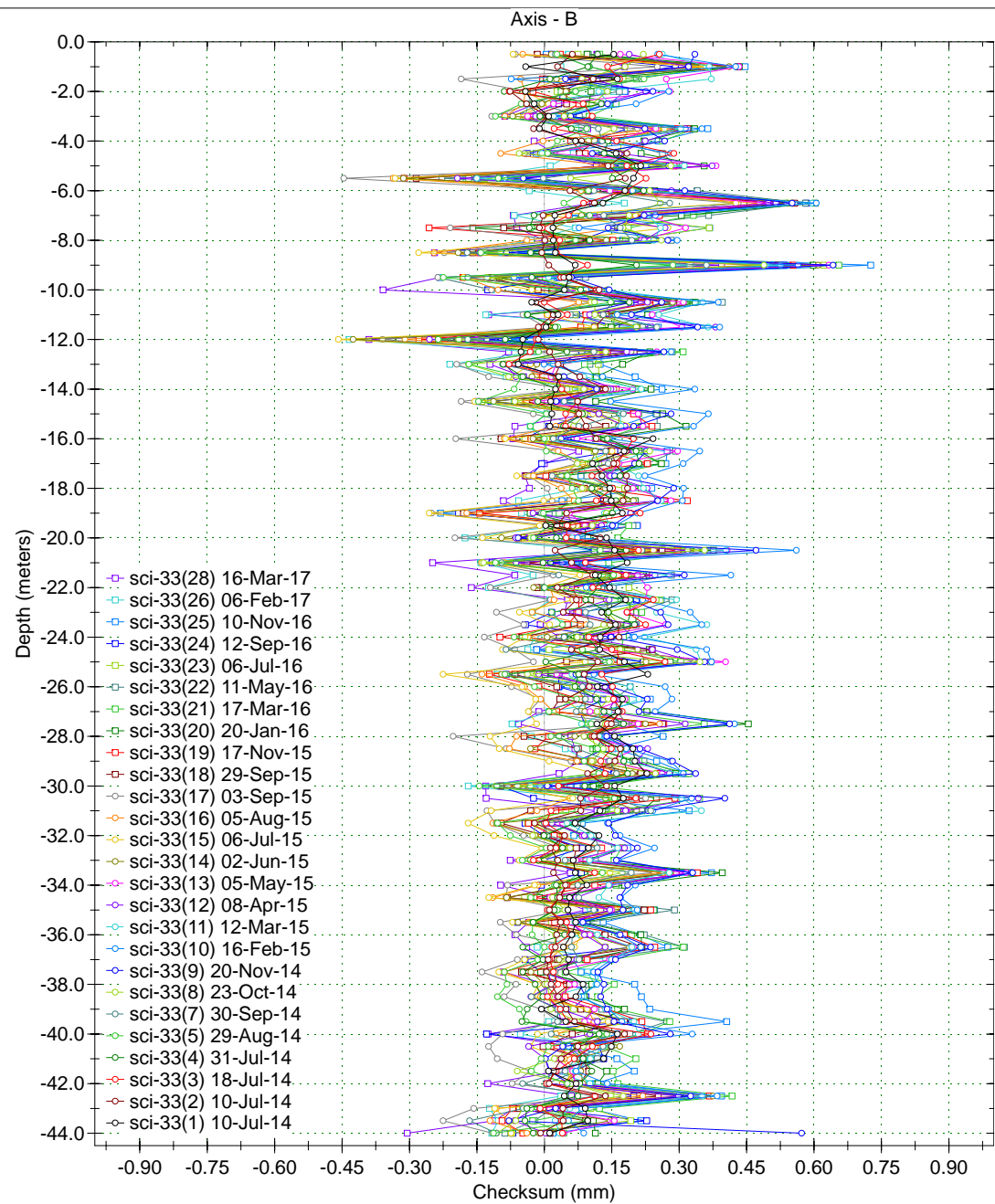
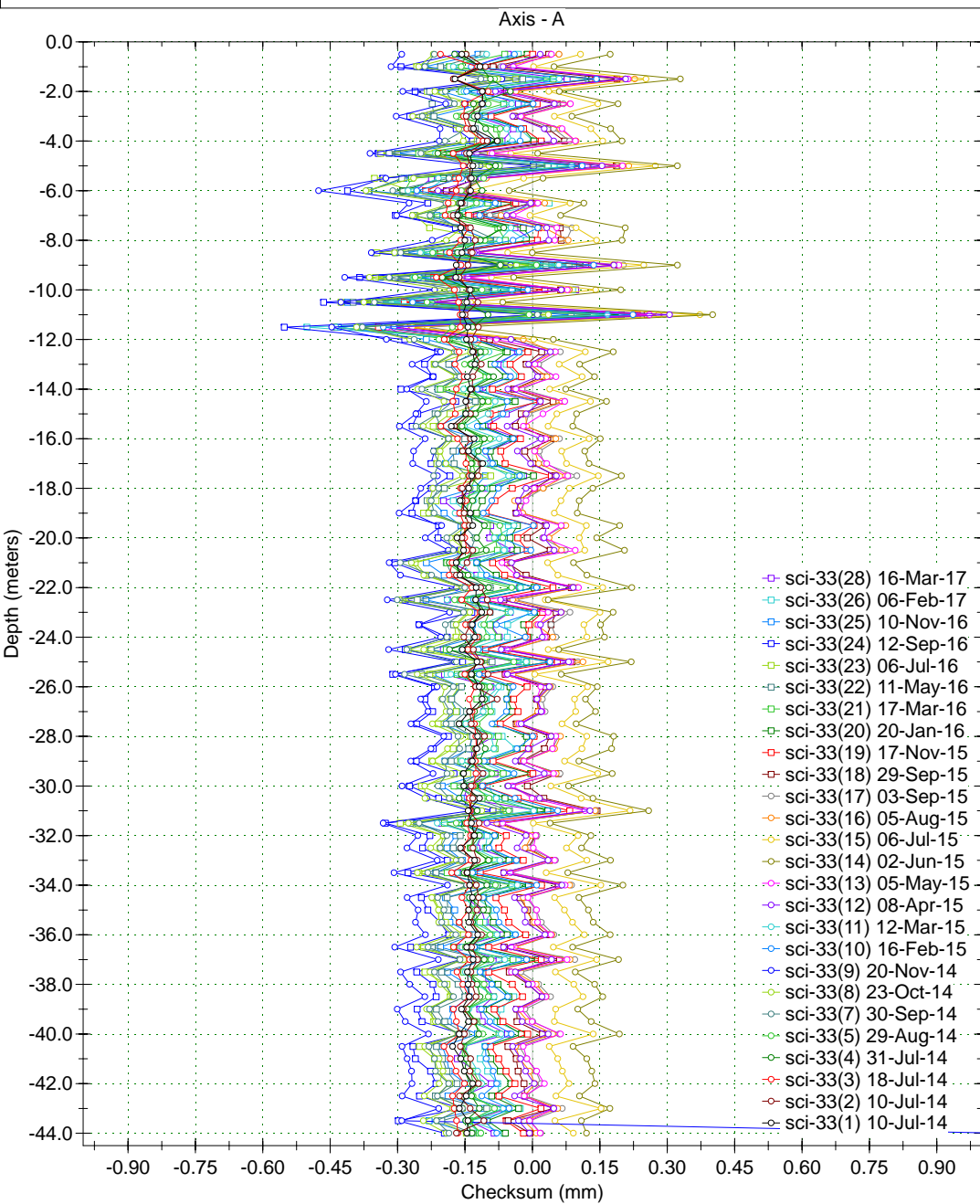
Borehole : sci-33
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 44.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jul 10 11:18
 Applied Azimuth : 0.0 degrees



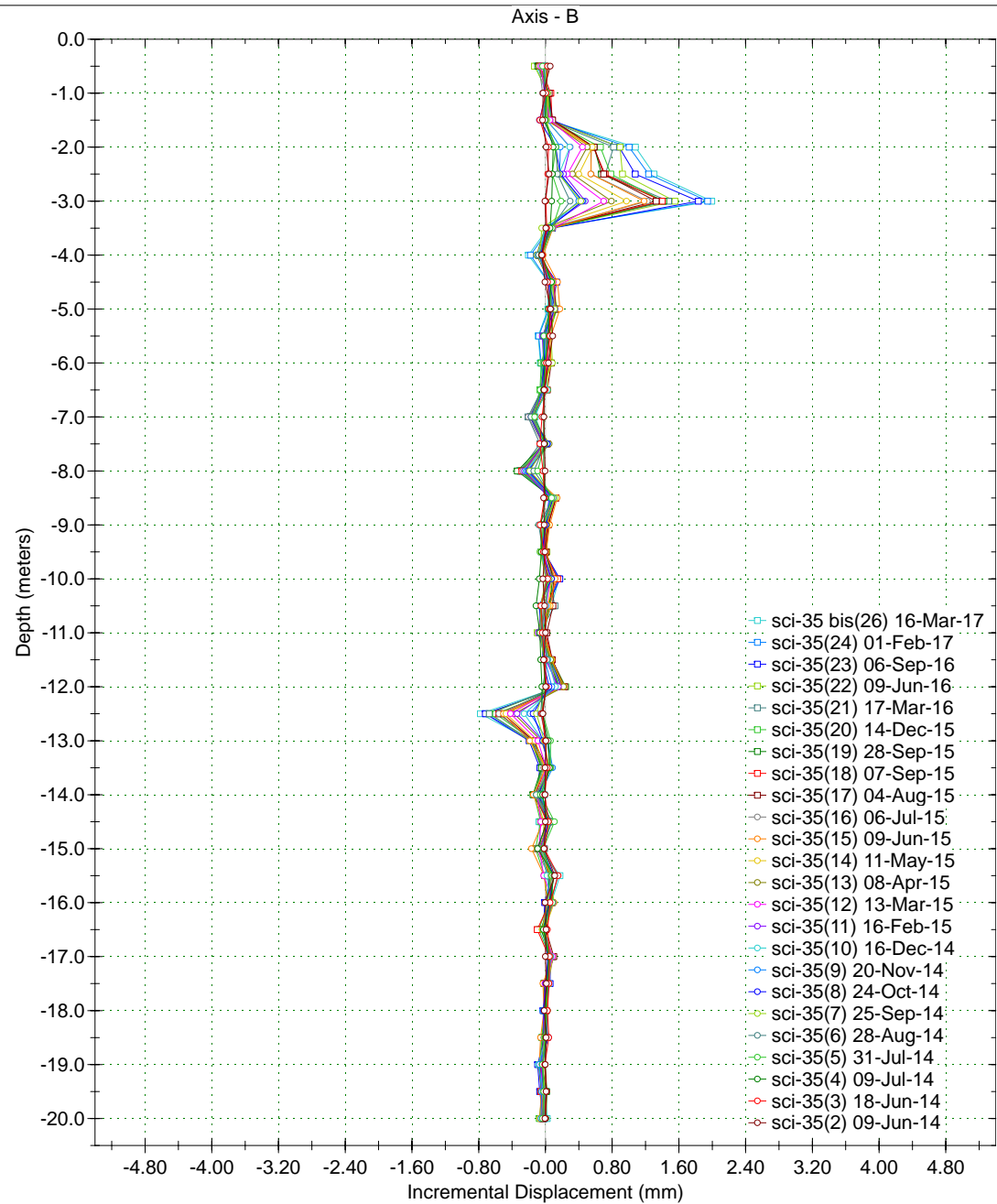
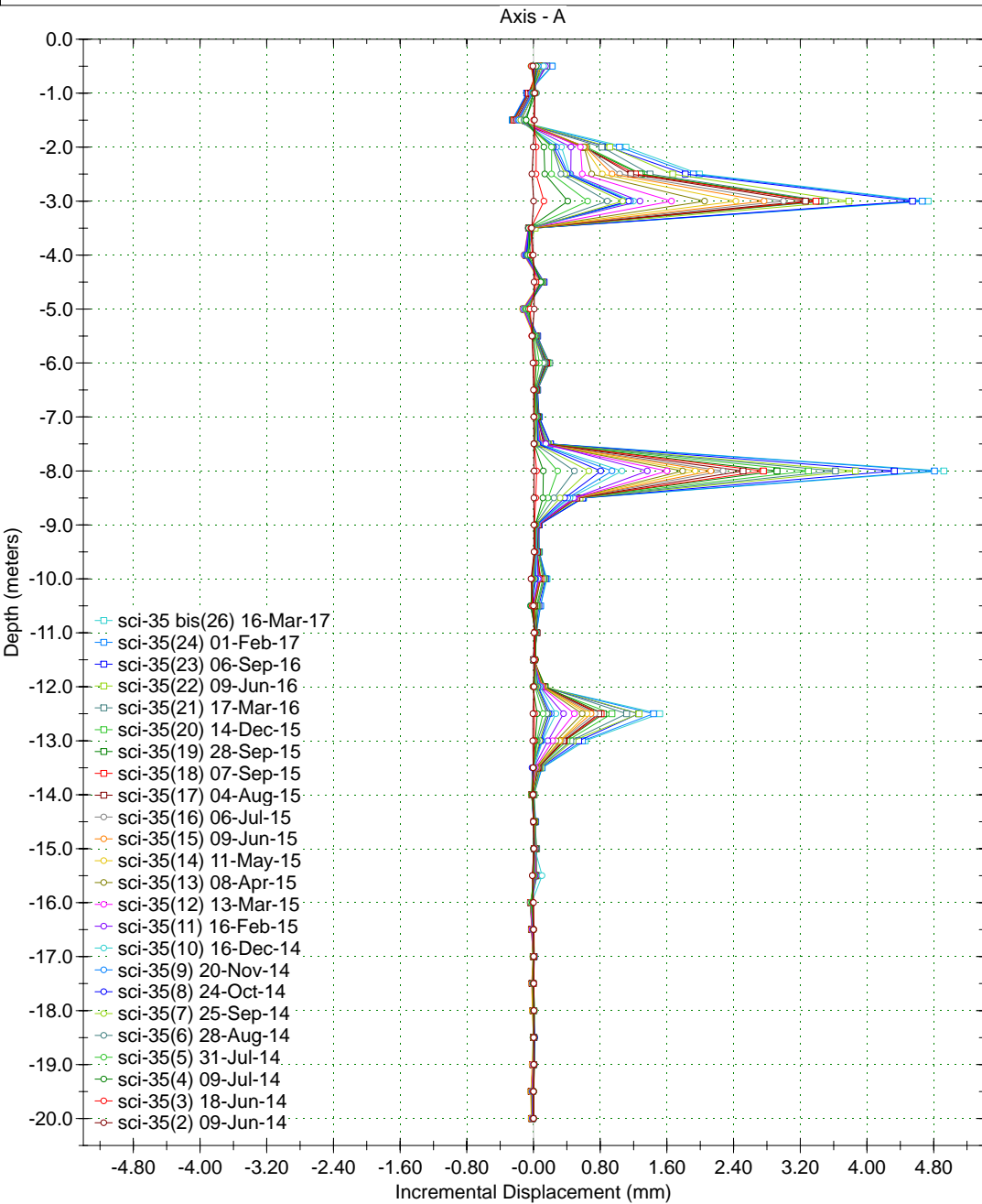
Borehole : sci-33
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 44.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jul 10 11:18
Applied Azimuth : 0.0 degrees



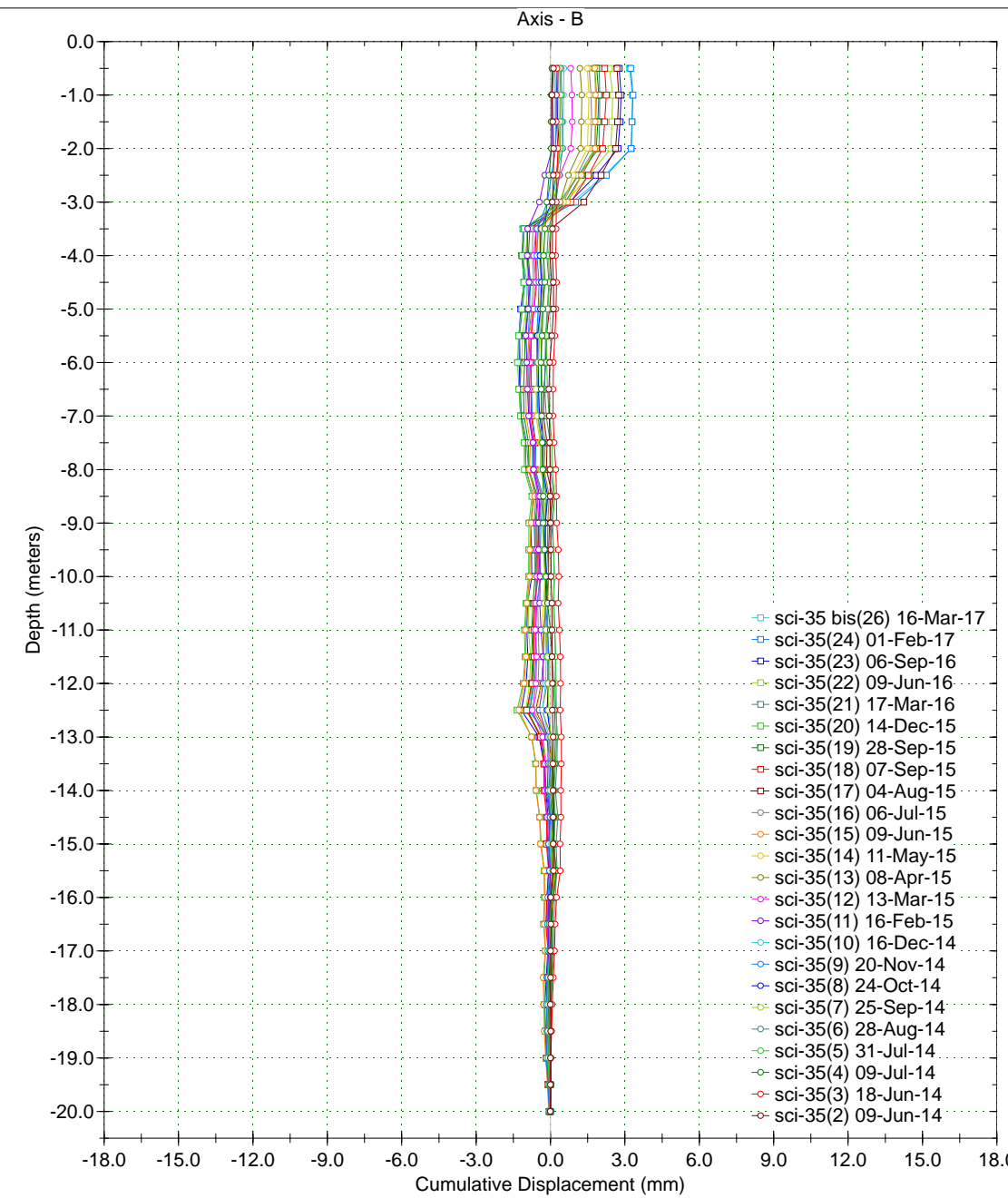
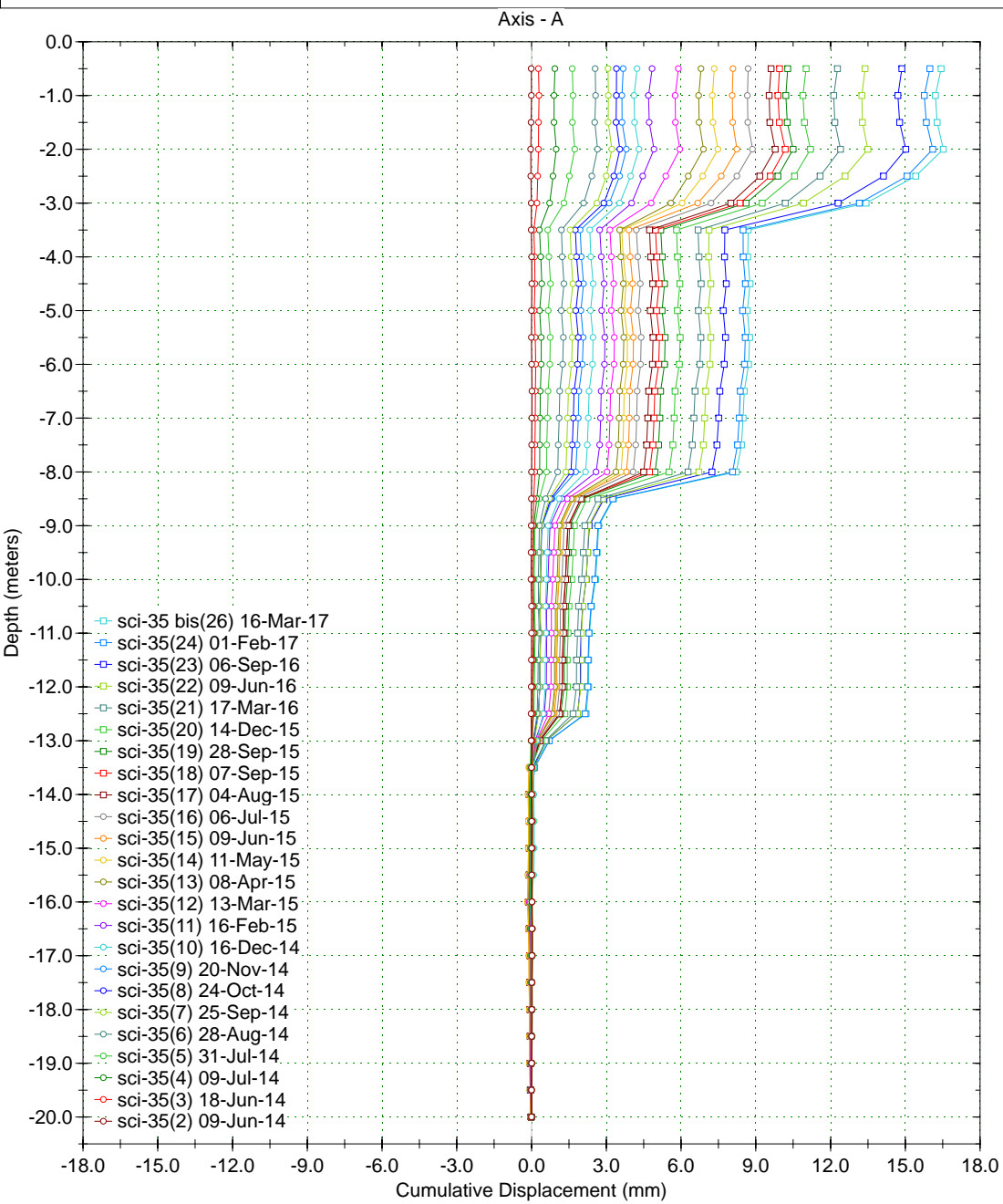
Borehole : sci-35 bis
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 20.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jun 09 11:06
 Applied Azimuth : 0.0 degrees



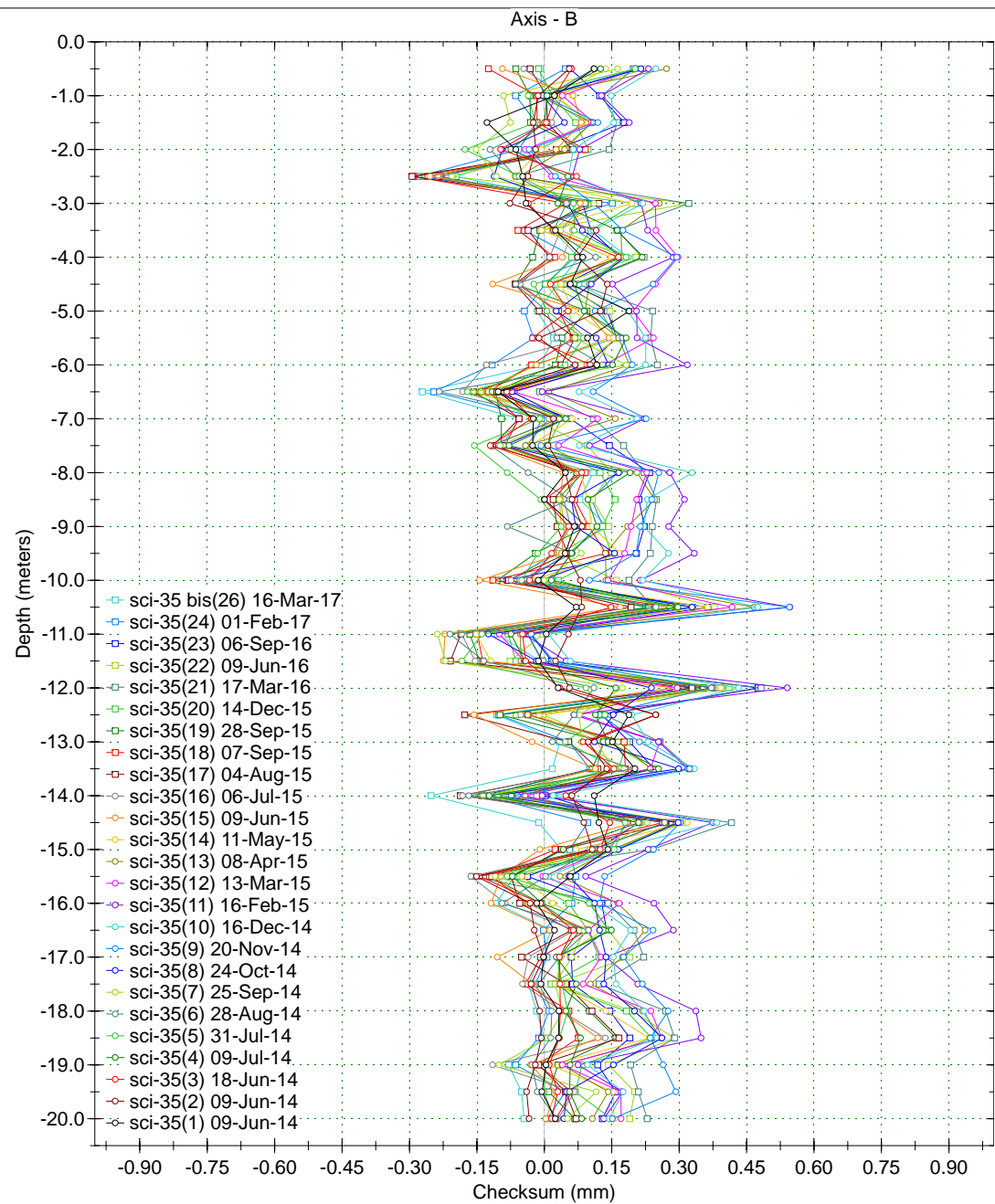
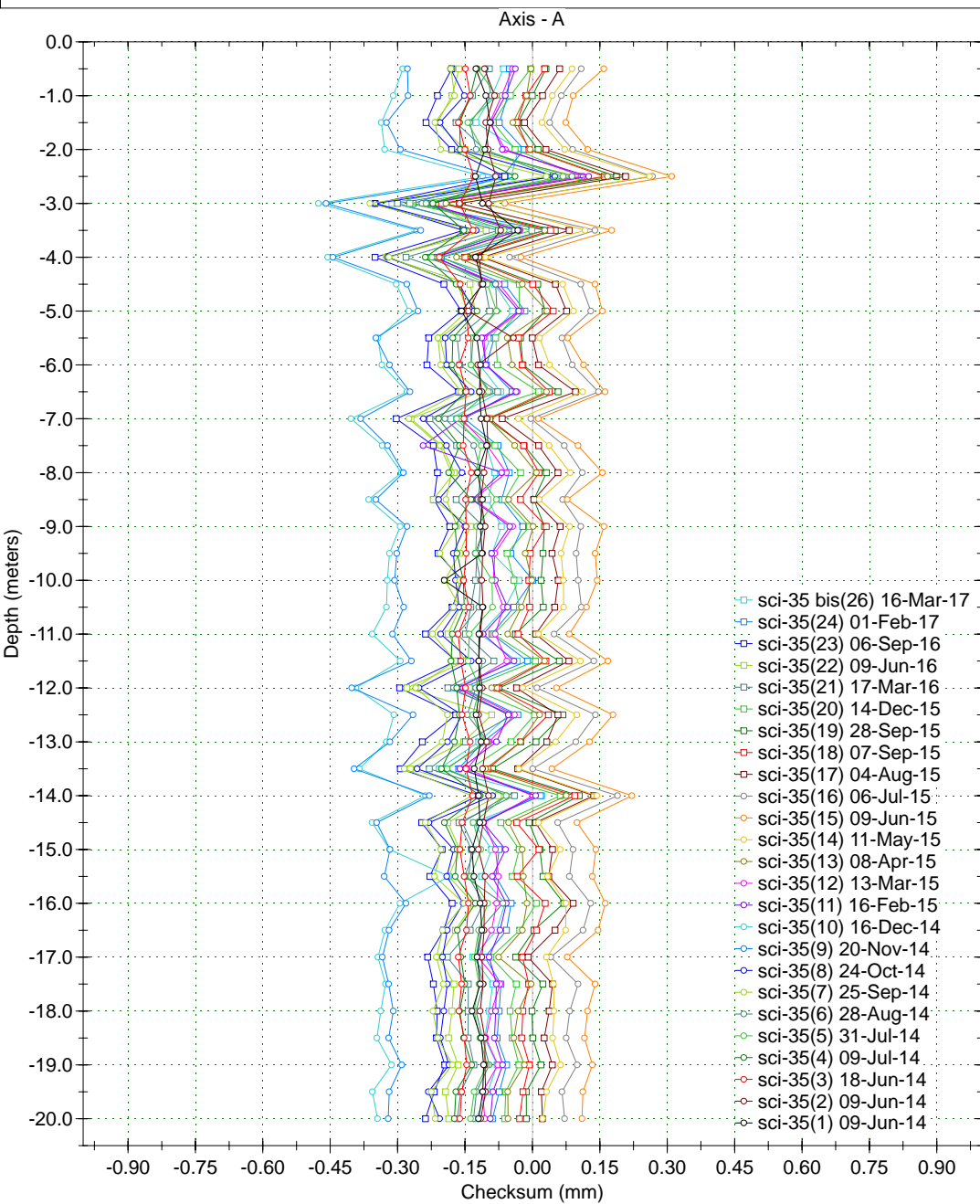
Borehole : sci-35 bis
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 20.0 meters
A+ Groove Azimuth :
Base Reading : 2014 Jun 09 11:06
Applied Azimuth : 0.0 degrees



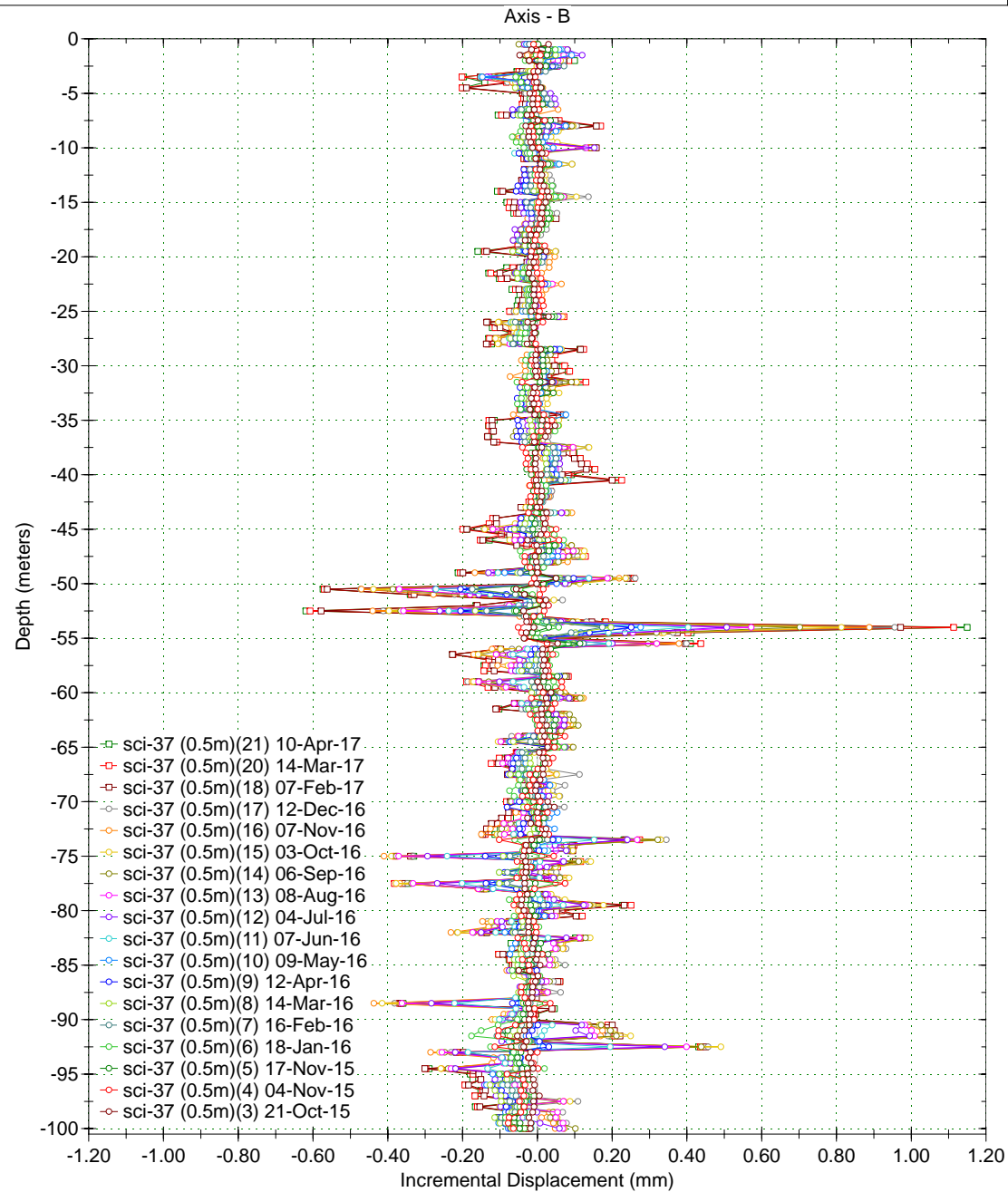
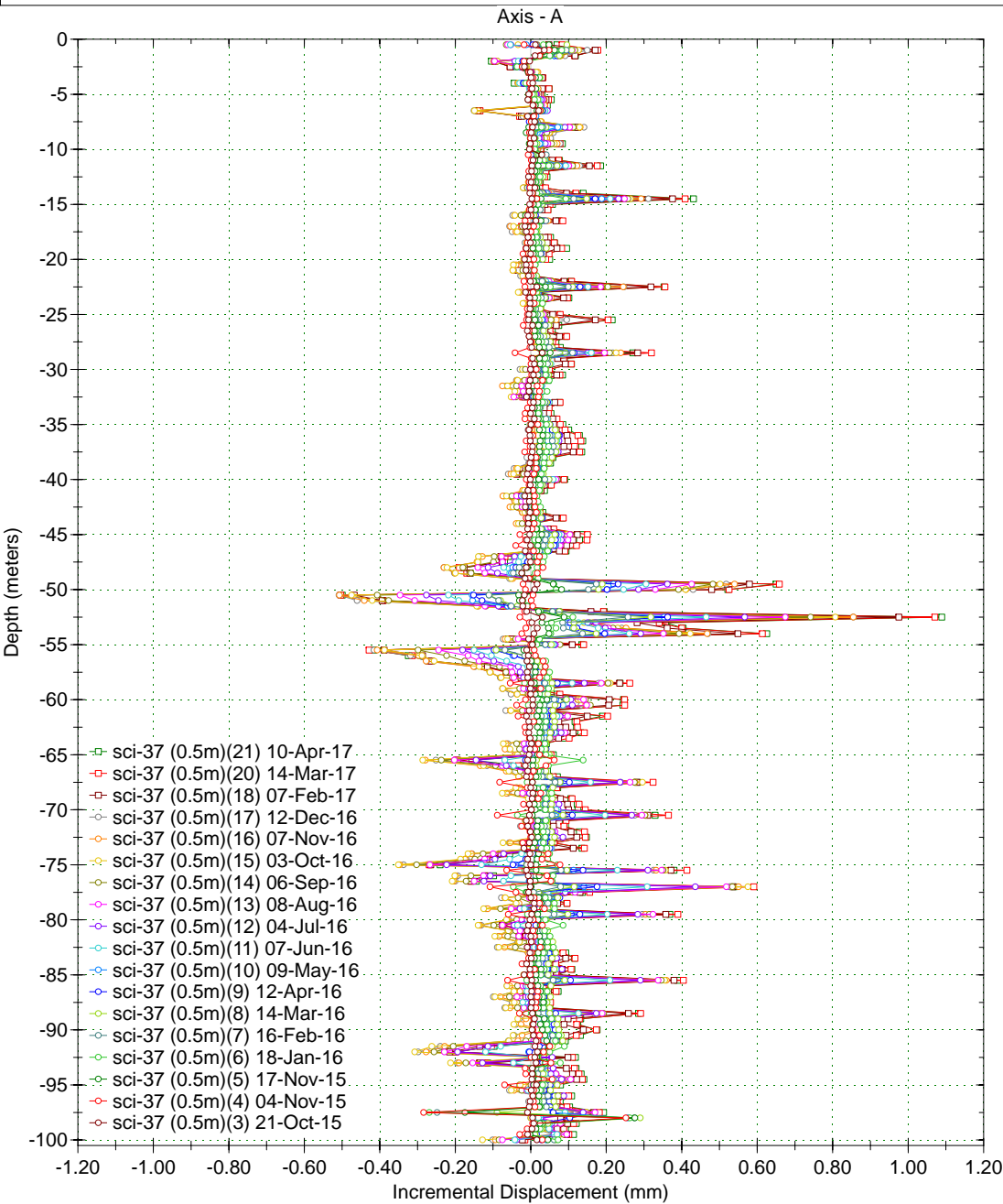
Borehole : sci-35 bis
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 20.0 meters
 A+ Groove Azimuth :
 Base Reading : 2014 Jun 09 11:06
 Applied Azimuth : 0.0 degrees



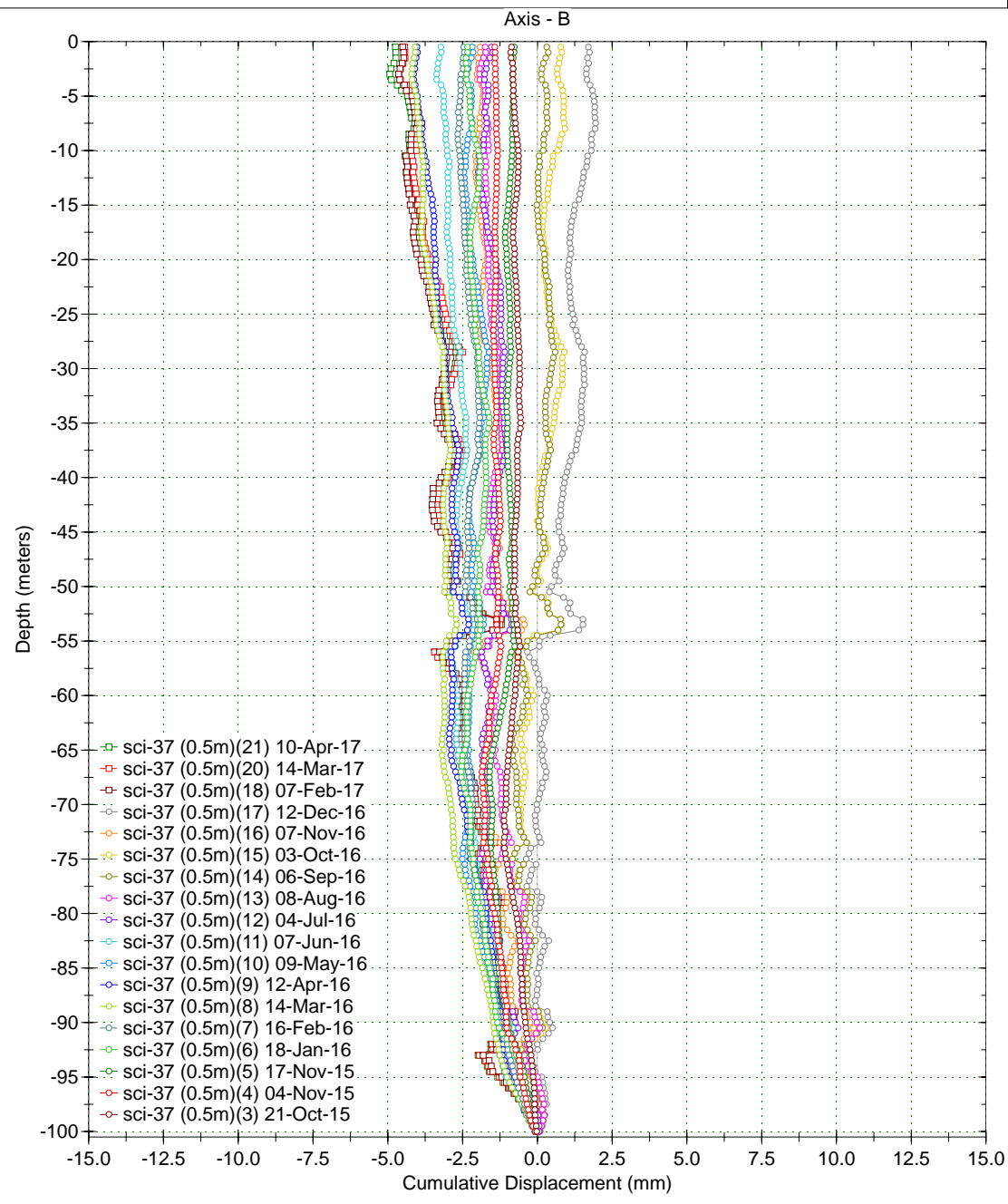
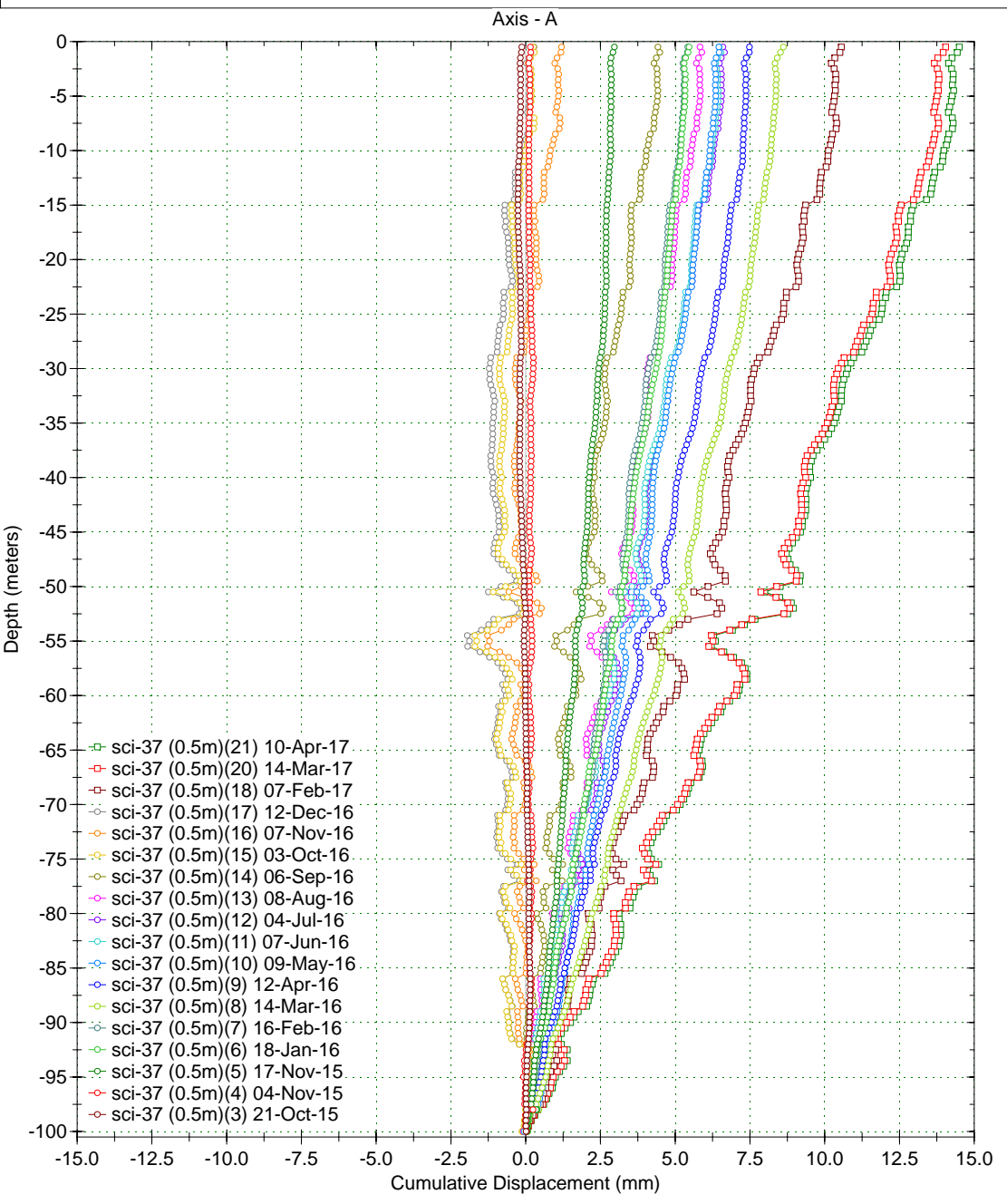
Borehole : sci-37
 Project : YESA - MARGEN DCHA (0.5m)
 Location :
 Northing :
 Easting :
 Collar :

Spiral Correction : N/A
 Collar Elevation : 0.0 meters
 Borehole Total Depth : 100.0 meters
 A+ Groove Azimuth :
 Base Reading : 2015 Oct 13 12:20
 Applied Azimuth : 0.0 degrees



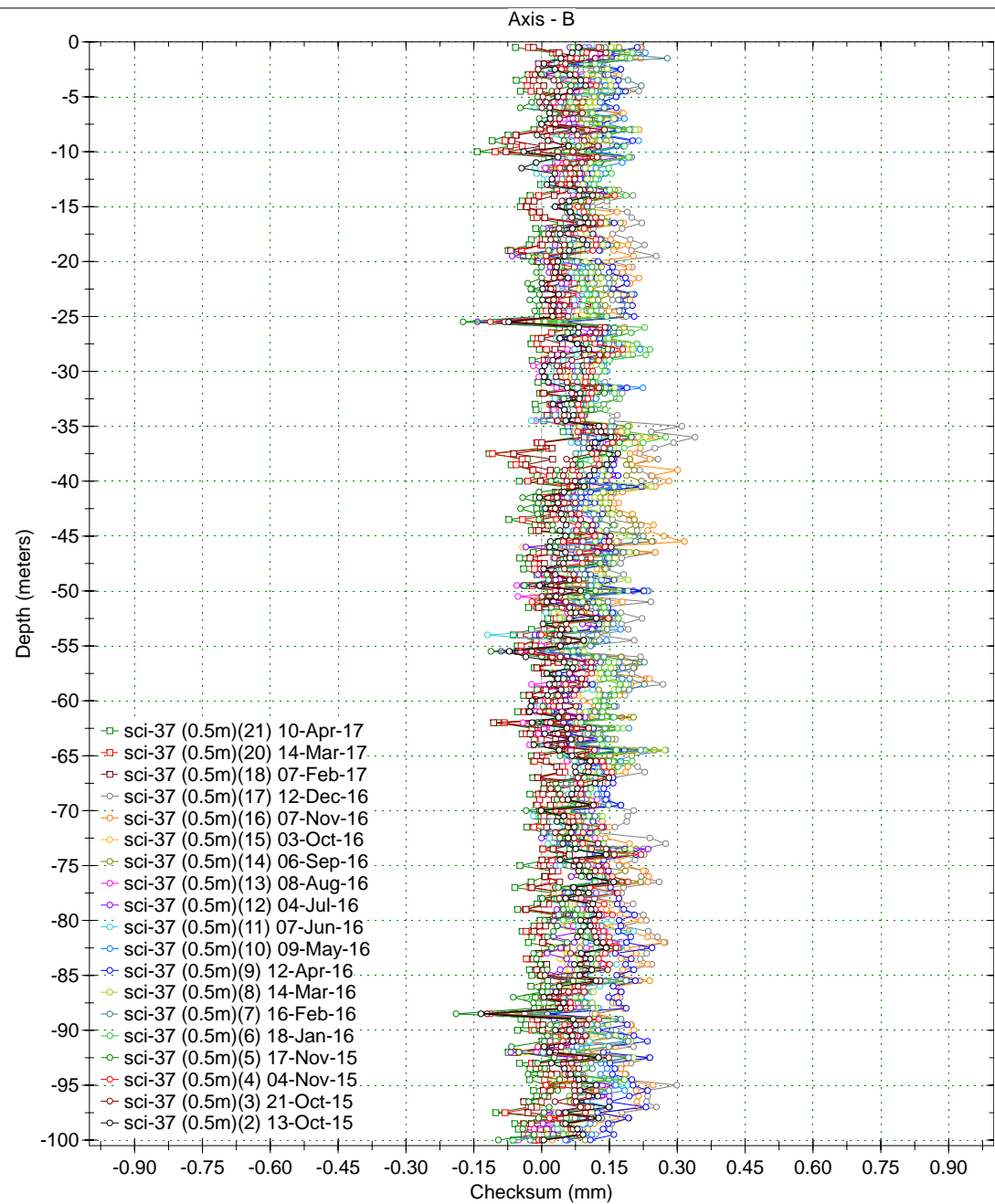
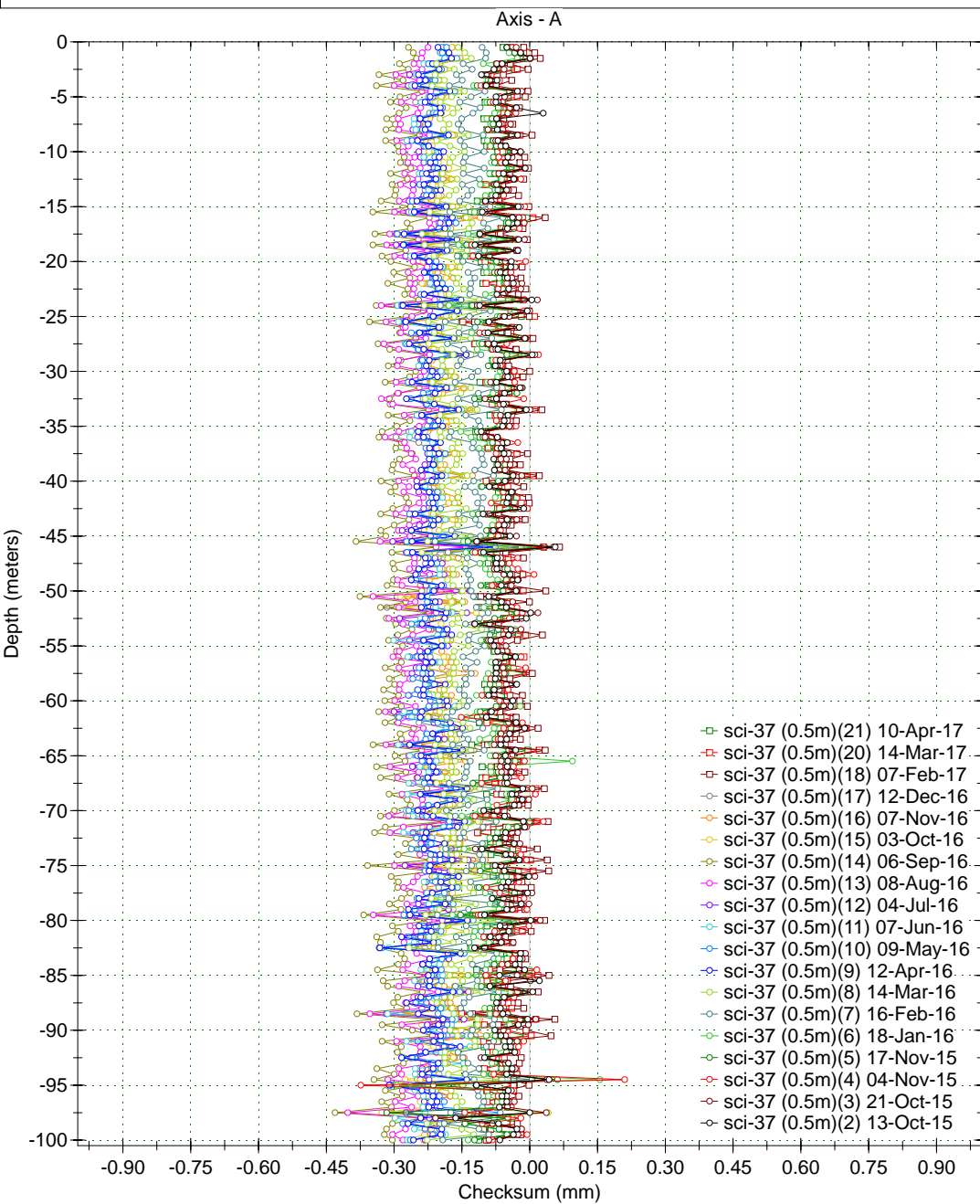
Borehole : sci-37
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 100.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Oct 13 12:20
Applied Azimuth : 0.0 degrees



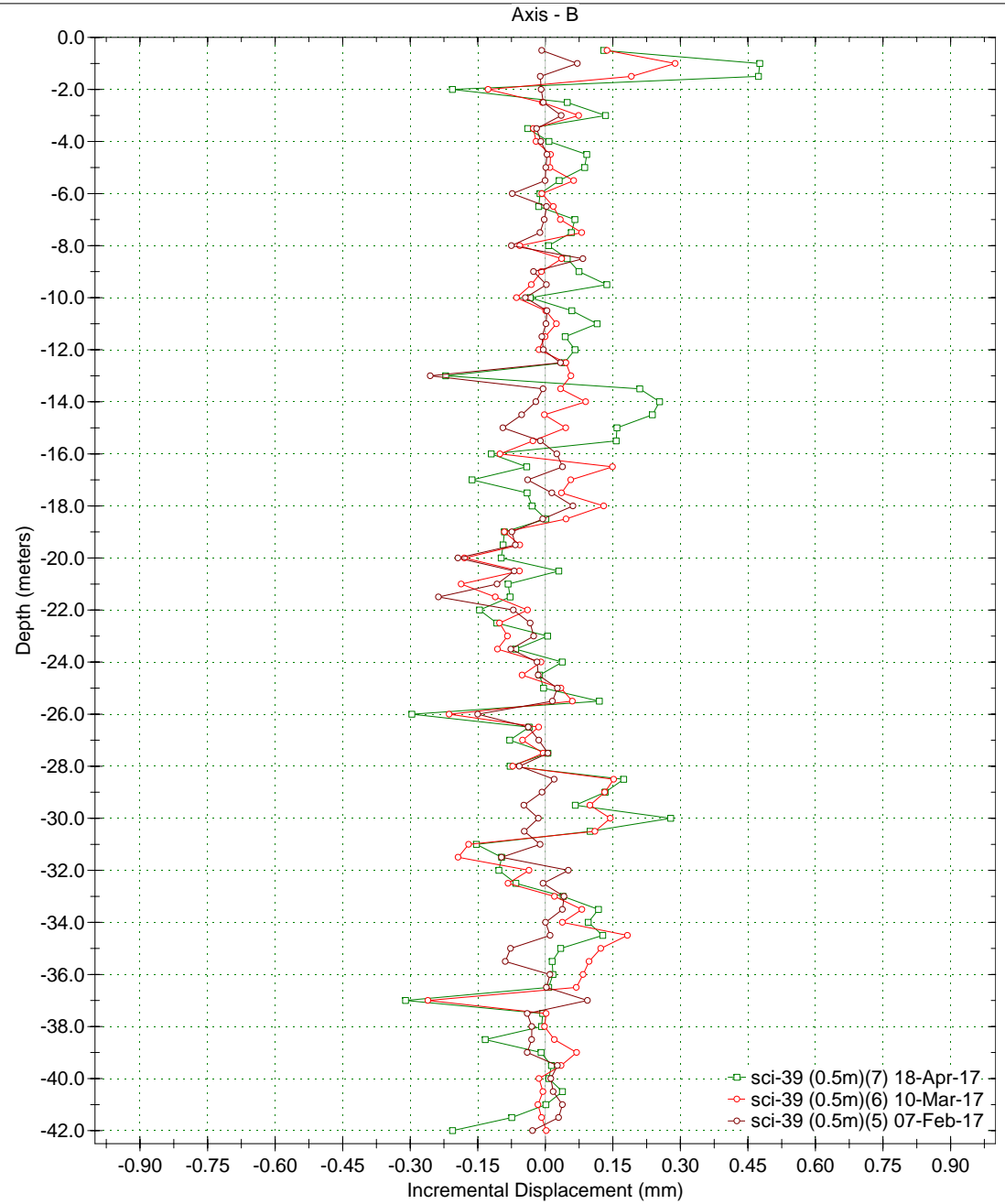
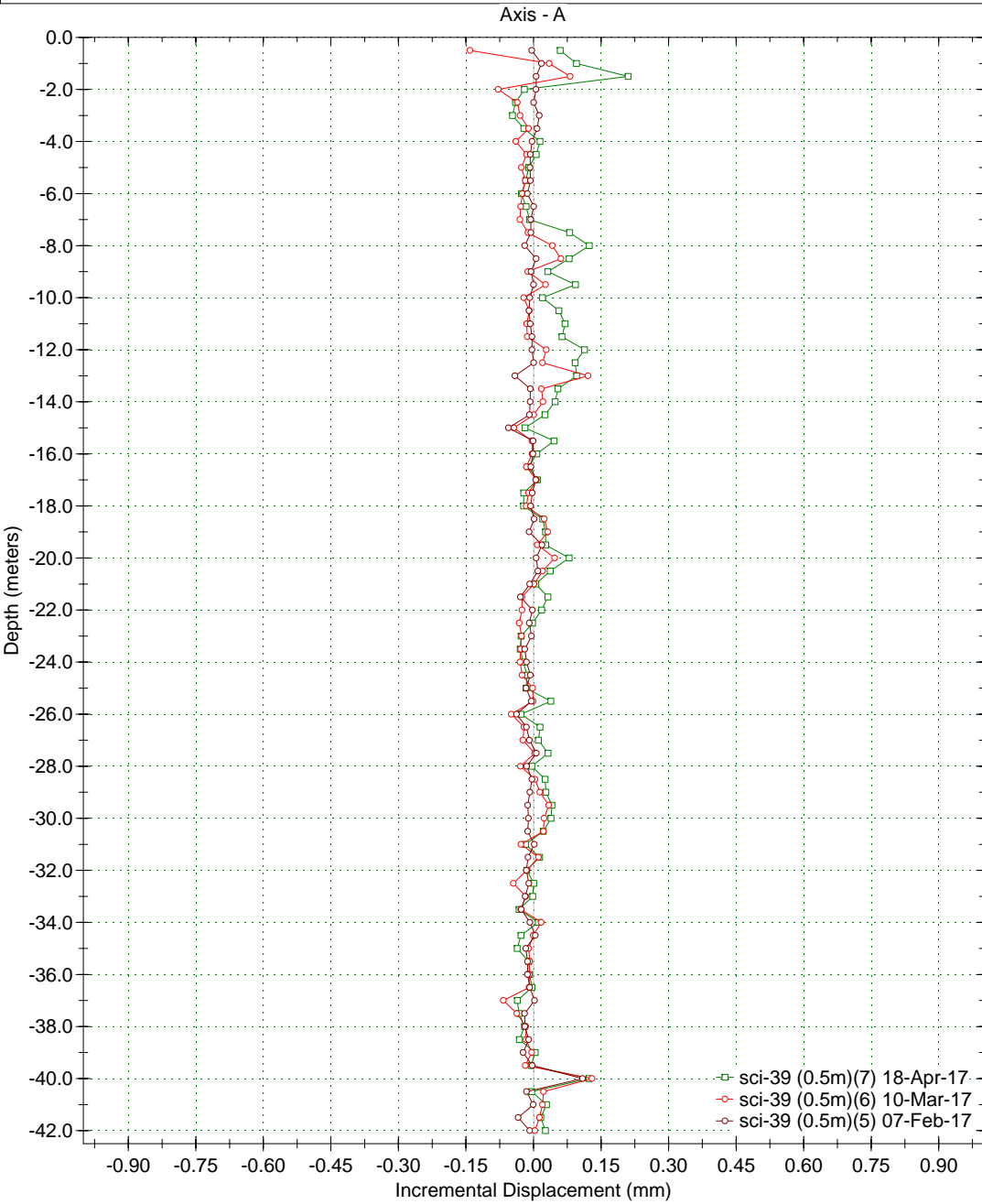
Borehole : sci-37
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 100.0 meters
A+ Groove Azimuth :
Base Reading : 2015 Oct 13 12:20
Applied Azimuth : 0.0 degrees



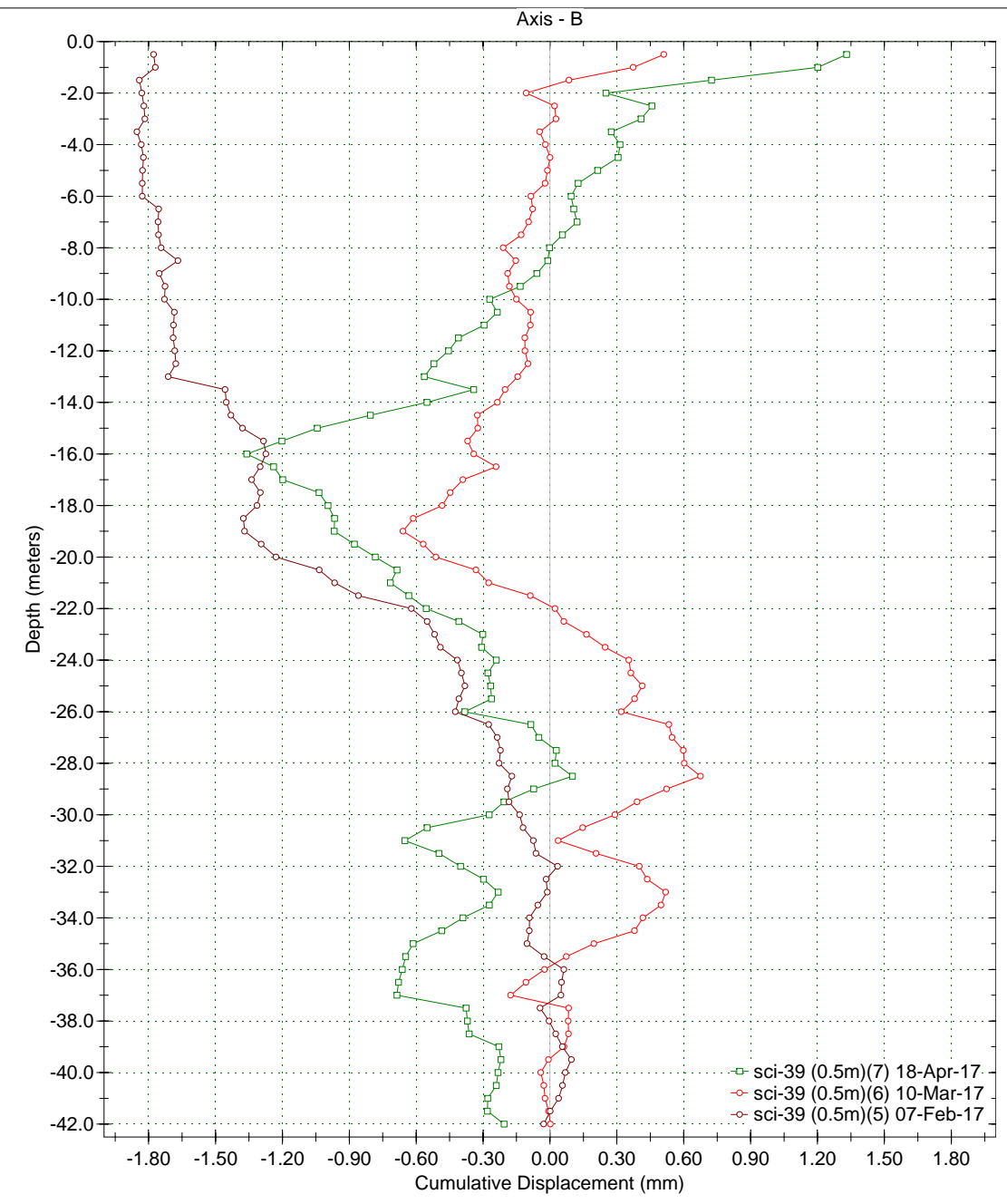
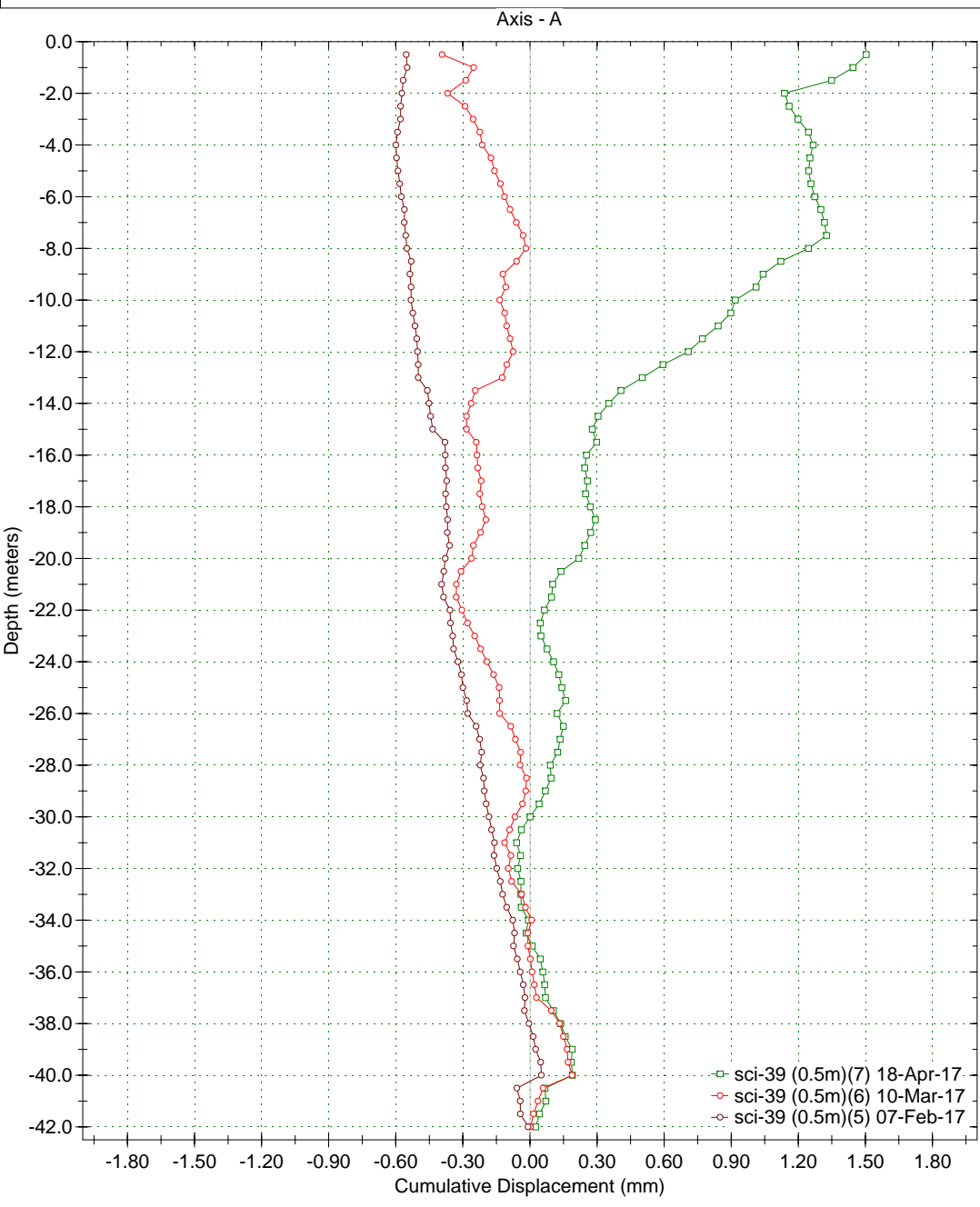
Borehole : sci-39
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 42.0 meters
A+ Groove Azimuth :
Base Reading : 2017 Feb 07 18:08
Applied Azimuth : 0.0 degrees



Borehole : sci-39
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 42.0 meters
A+ Groove Azimuth :
Base Reading : 2017 Feb 07 18:08
Applied Azimuth : 0.0 degrees



Borehole : sci-39
Project : YESA - MARGEN DCHA (0.5m)
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 42.0 meters
A+ Groove Azimuth :
Base Reading : 2017 Feb 07 18:08
Applied Azimuth : 0.0 degrees

