TU Delft PSI viewer practical exercises

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Goal: These exercises are intended to get a feel for Persistent Scatterer and Distributed Scatterer time series analysis results. Furthermore, the aim is to provide training in the interpretation of such results.

Platform host: The web-based interactive tools are courtesy of SkyGeo. SkyGeo provides InSAR services and solutions to customers in the energy, water, and infrastructure sector. (www.skygeo.com)

After this exercise you will be able to change settings, find the most interesting point and visualize the data in your own system like Excel or QGIS.

There are two exercises:
1. Discovering the characteristics of PS-InSAR products and interpreting data
2. Advanced data analysis.

Exercise 1, Discovering characteristics of PS/DS-InSAR products and interpreting data

Go to the web page:
https://maps.skygeo.com/
and login with the UserName and Password provided to you in class:

After logging in, you will see three of portals:

1. **A10_amsterdam_sciencepark (TerraSAR-X data), Amsterdam, the Netherlands**
2. **Chongqing (Sentinel-1 data), China,**
3. **Satelliet_zettingsmetingen (TerraSAR-X data), Amsterdam, the Netherlands**

You can use all three portals to investigate the information content of these information products.

1a. Go to the Chongqing portal.
 (Depending on your location, you may need a VPN connection)

Answer the questions below.
Note that there is one map layer for:
- Sentinel-1 ("S1") satellite ascending ("**asc**") orbit
- Full time series of about 3.5 years

By right-clicking on the layer, information can be retrieved

Questions:

1. How many SAR images were used in each layer?
   ……………………………………………………………………………………………………
2. How often did the satellite pass over Chongqing?
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3. What is the viewing geometry of the sensor (line-of-sight angle)? Are the results projected?
   ………………………………………………………………………………………………….
4. Change the colormap so that you can find the points with the strongest deformation. Write down some point-id's which show very strong subsidence? How much subsidence is it?
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5. What does the point-id indicate?
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6. What is the ground resolution of the PS points and why is there a difference between along and across track? Does the PS point indicate the deformation of the whole pixel?
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7. What are the gray time series shown above and below the black time series? Why are these shown?
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8. Find points with seasonal variability. What is a likely explanation for this behavior?

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After exercise 1a you should be able to:
- Inspect and understand the layer meta data
- Inspect and understand point meta data
- Make selection based on point quality
- Make selection based on absolute deformation
- Change base maps
- Being able to identify an intermittent scatterer
- Being able to identify an unwrapping error
- Being able to enable result layers
- Inspect properties of entities in result layers
- Use the function to select a subset of the time-series to deformation rates for a specific period in time

1b. Go to the A10_amsterdam_sciencepark portal.
(Depending on your location, you may need a VPN connection)

Answer the questions below.
Note that there are four map layers for:
- TerraSAR-X ("TSX") satellite ascending ("**asc**") and descending ("**dsc**") orbit
- **PS** and **DS** (Point- and Distributed Scatterers)
- Full time series of about 5 and 3 years.

By right-clicking on the layer, information can be retrieved

Questions:

1. How many SAR images were used in each layer?
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2. How often did the satellite pass over Amsterdam?
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3. What is the viewing geometry of the sensor (line-of-sight angle)? Are the results projected?
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4. Activate only the "TSX asc ps " layer and change the colormap so that you can find the points with the strongest deformation. Write down a couple of point-id's which show very strong subsidence? How much subsidence is it?
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5. What does the point-id indicate?
   …………………………………………………………………………………………………

6. What is the ground resolution of the PS points and why is there a difference between along and across track? Does the PS point indicate the deformation of the whole pixel?
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7. Can you find dikes, railways, highways and bridges? What do you observe
   ………………………………………………………………………………………………….

8. If ascending and descending products show comparable results, how would you interpret that?

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Only activate the "TSX dsc ps low" layer and only display points that show more subsidence than 8 mm/yr.

9. Click on one of the strongest deforming points. In this time-series, give some reasons of deviation from the line.

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10. What is deformation in mm/yr in the first year of this time-series and what in the last year. What might be the reason for this difference?

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Enable the DS and PS

11. Write down the differences you see between these layers. Explain why:
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12. What do the grey dots in the time series imply?
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13. Select the ascending and the descending PS data. From the menu click on the Summation sign. Select an area with a box, and compare the time series between the ascending and the descending data.
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After exercise 1b you should be able to:
- Inspect and understand the layer meta data
- Inspect and understand point meta data
- Make selection based on point quality
- Make selection based on absolute deformation
- Use the search function to find specific areas
- Understand the difference between PS and DS layers
- Understand the difference between dsc and asc layers
- Change base maps
- Being able to identify an intermittent scatterer
- Being able to identify an unwrapping error
- Being able to enable result layers
- Inspect properties of entities in result layers
- Use the function to select a subset of the time-series to deformation rates for a specific period in time

1c. Go to the Satelliet zettingsmetingen portal.
(Depending on your location, you may need a VPN connection)

Answer the questions below.
Note that there are four map layers for:
- TerraSAR-X ("TSX") satellite ascending ("**asc**") and descending ("**dsc**") orbit
- **PS** and **DS** (Point- and Distributed Scatterers)
- **High** (Hoge) and **Low** (Lage) points
- Full time series of about 9 years, and 2 year time series ("**2y**" in the name).

By right-clicking on the layer, information can be retrieved

Questions:

1. How many SAR images were used in each layer?
   ……………………………………………………………………………………………………
2. How often did the satellite pass over Amsterdam?
   …………………………………………………………………………………………………….
3. What is the viewing geometry of the sensor (line-of-sight angle)? Are the results projected?
   ……………………………………………………………………………………………………
4. Activate only the "TSX asc 2y ps low" layer and change the colormap so that you can find the points with the strongest deformation. Write down a couple of point-id's which show very strong subsidence? How much subsidence is it?
   ……………………………………………………………………………………………………

5. What does the point-id indicate?
   ……………………………………………………………………………………………………

Now activate only the PS layers of the 9-year time series

6. What is the ground resolution of the PS points and why is there a difference between along and across track? Does the PS point indicate the deformation of the whole pixel?
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7. (type the address: 1, Paradijsplein, Oostpoort, Amsterdam, Netherlands)
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8. Zoom in on the area. Enable the result layers for roads and buildings. Why are the buildings much more stable than the roads?

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Only activate the "TSX dsc ps low" layer and only display points that show more subsidence than 8 mm/yr.

9. Click on one of the strongest deforming points. In this time-series, give some reasons of deviation from the line.

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10. What is deformation in mm/yr in the first year of this time-series and what in the last year. What might be the reason for this difference?

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Enable the PS low 8-year layers and the PS low 2-year layers

11. Write down 3 differences you see between these layers. Explain why:

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Now activate the "TSX dsc PS low" and "TSX dsc DS low" layers.

12. Find an area where you see DS points and no PS points. Can you explain why?

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13. Click on one DS point. How many pixels were used for that DS point

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After exercise 1 you should be able to:
- Inspect and understand the layer meta data
- Inspect and understand point meta data
- Make selection based on point quality
- Make selection based on absolute deformation
- Use the search function to find specific areas
- Understand the difference between PS and DS layers
- Understand the difference between dsc and asc layers
- Understand the difference between high and low layers
- Change base maps
- Being able to identify an intermittent scatterer
- Being able to identify an unwrapping error
- Being able to enable result layers
- Inspect properties of entities in result layers
- Use the function to select a subset of the time-series to deformation rates for a specific period in time