Analyzing image data with TIMESAT

Model answers

1. This can be achieved using **TSM_printseasons** resulting in the information below. The retrieved beginning of season dates are 32.82, 66.32, 102.9, and 143.9.

```
  Now enter the window you wish to display data for
  First row: 200
  Last row: 200
  First column: 350
  Last column: 350

  Name of output text file (hit Enter to print to screen):

  Row, Column:  200 350
Season 1
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   32.82    48.74    15.91    52.80   43.23    110.1    57.25    4.092    15.02    1613.    662.9    69.08    65.14
Season 2
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   66.32    84.45    18.13    48.05   76.44    119.7    71.69    6.924    11.78    1952.    991.2    67.56    64.39
Season 3
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   102.9    120.8    17.90    46.67   113.6    116.4    69.73    5.586    11.33    1841.    907.7    63.56    64.66
Season 4
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   143.9    158.0    14.07    47.70   153.1    111.5    63.77    5.089    15.27    1389.    626.0    63.43    63.87
```

   Following the logic of the previous practical (questions 9 and 10), this corresponds approximately to 24 November 2013, 29 October 2014, 4 November 2015, 25 December 2016. Note that you may have found a difference of ±1 day due to rounding off.

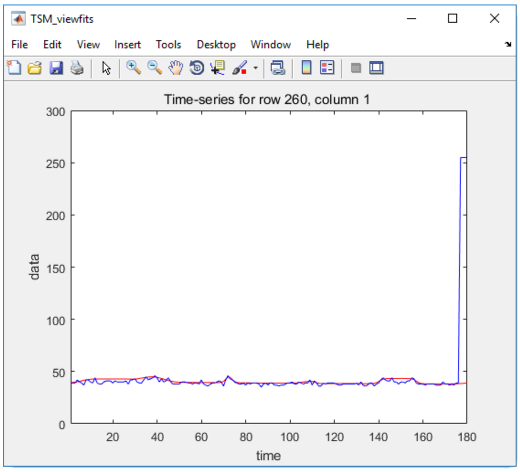
2. This question is split up in various parts:
   a. For all seasons. See below the output of the **TSM_printseasons**:

```
  First row: 260
  Last row: 260
  First column: 1
  Last column: 1

  Name of output text file (hit Enter to print to screen):

  Row, Column:  260 1
Season 1
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   31.88    46.30    14.42    41.04   38.23    44.84    3.798   0.3600   0.5903    736.6    38.85    43.27    40.71
Season 2
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   70.04    75.12    5.074    39.11   72.48    44.74    5.634    1.888    1.743    294.8    21.06    40.68    40.35
Season 3
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   103.6    112.6    8.997    38.66   108.9    40.58    1.927   0.2702   0.6252    438.0    12.82    39.31    38.97
Season 4
  Beg. t.   End t.  Length  Baseval.  Max t.  Max val.   Ampl.   L-der.   R-der.  L-integ. S-integ. Start val.  End val.
   139.3    158.0    18.68    38.28   148.7    43.35    5.073    1.152    1.220    887.6    83.78    39.66    39.43
```

   b. The series can be plotted using **TSM_viewfits**. The resulting profile (below) indicates that there is very limited variability of NDVI throughout the time series. While the double logistic model was fitted, we cannot expect this to result in a good representation of real seasonal variability in the greenness of vegetation. Mostly we see a noisy profile.



c. Including such pixels can result in strange results, given that the retrieved dates likely do not relate greatly to vegetation seasonality. We rather want to avoid processing for locations with very limited variability in NDVI. With TIMESAT we can achieve this by setting an "Amplitude cutoff" value. We had now left it at 0, but a larger value would avoid processing pixels with limited amplitude. Note that the value needs to be defined in the units of the data (so here in DN-numbers).

   The general lesson to draw from this is that retrieving phenology is often an iterative process, which may require to revisit some of the settings initially applied. In our case, we had evaluated a number of pixels in the TIMESAT point data practical. However, those pixels were not representative for all conditions that we find across the image. In the next practical we will first re-run TIMESAT for the image data, but now adding an amplitude cut-off value. Subsequently we will visualize the results and export the data to a Geographical Information System (GIS).