**SCS\_toolbox**

**the Standalone channel shifting toolbox description**

**Module 1**

**M1\_centerline**

**Summary**

Generate channel centerline from individual polygons, or if channel segmentation is selected, calculate channel centerline for the union of channel polygons.

In this module is created layer: "centro\_{year}.shp" for individual centerline and "SegCenterline.shp" for segmentation centerline.

**Output folder path**

The folder where are saved all results and temporary files if deleted processing files are not selected.

In this folder is created layer: "centro\_{year}.shp" for individual centerline and "SegCenterline.shp" for segmentation centerline.

**Input channel polygons**

Channel polygons with information about the year are stored in the attribute table field. The name of this field is the same for all channel polygon layers.

Channel polygons represent vectorised active channels with water areas and gravel bars and must be one polygon object without side tributaries. Polygon objects can contain doughnut hollows, which are islands.

**Channel polygons year field name**

Name of the field where information about a year is stored in the attribute table.

**Calculation segmentation centerline (union of channel polygons)**

Check if you want to calculate the segmentation centerline. The default value is FALSE.

If it is checked, the segmentation centerline is calculated (for the union of polygons).

**Delete processing files**

Check if you want to delete processing files. The default value is FALSE.

If individual centerline calculation is selected in the output folder, saved copies of polygons (CH\_{year}.shp) and polygons without hollows (POL\_{year}.shp) are preserved.

If the segmentation centerline calculation is selected in the output folder, it is a saved copy of polygons (CH\_{year}.shp) and a union of channel polygons ("union\_channel.shp").

***Module 2***

**M2\_segmentation**

**Summary**

Generate longitudinal segments from channel polygons. Modul using segmentation centerline from Module1.

In this module is a created layer: " Segments\_{spatial\_interval}m.shp", which represents a spatial segmented layer from the union of all polygons and longitudinally divided based on the spatial interval in meters.

Polygon layer content two basic attribute fields:

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

**Output folder path**

The folder where are saved all results and temporary files if deleted processing files are not selected.

In this folder is a created layer: " Segments\_{spatial\_interval}m.shp", which represents a spatial segmented layer from the union of all polygons and longitudinally divided based on the spatial interval in meters.

Polygon layer content two basic attribute fields:

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

**Input channel polygons**

Channel polygons with information about the year are stored in the attribute table field. The name of this field is the same for all channel polygon layers.

Channel polygons represent vectorised active channels with water areas and gravel bars and must be one polygon object without side tributaries. Polygon objects can contain doughnut hollows, which are islands.

**Input segmentation centerline**

The centerline is calculated for all channel polygons or valley axes. It can be calculated in the module M1\_centerline or vectorised manually. The centerline is a line feature, oriented in the direction of flow and cannot be multiline.

**Channel polygons year field name**

Name of the field where information about a year is stored in the attribute table.

**Spatial interval for segmentation (in meters)**

Define spatial interval for segment creation (value in meters)

**Smoothing of centerline (in meters)**

Define spatial interval for centerline smoothing. The parameter is used for the centerline in sinuous and meandering channels to generalise the centerline in a defined distance. If the value is defined, a new layer is created with the name: "centro\_simple\_{value}m.shp"

**Delete processing files**

Check if you want to delete processing files. The default value is FALSE.

In the output folder, saved copies of polygons (CH\_{year}.shp) are preserved.

**Module 3**

**M3\_EAcalculation**

**Summary**

Generate channel migration (E – Erosion and A – Accumulation/deposition) from channel polygons and calculate erosion and deposition of river channel for the left and right banks.

In this folder is created layer: "EA\_processes{year\_younger}\_{year\_older}.shp"" represent a spatial layer union among two consecutive time horizons (younger year and older) with in-channel processes information stored in attribute table:

["y\_{younger/older year}"] – year of channel polygon (null/NODATA value is not presented)

["TYP\_{younger/older year }]" – two main landforms for specified time horizon: “channel” and “island”

["EA"] – in-channel process of erosion or accumulation:

“erosion" – erosion of floodplain

"deposition" – deposition in the form of the new floodplain

"island\_erosion" – in-channel erosion of the island

“island\_deposition" – in-channel deposition in the form of the new island

"stable" - without changes

["SIDE\_{ younger/older year }"] – orientation of the process in the direction of the centerline for individual year

["direction"] – final orientation of the process (LEFT and RIGHT) based on the orientation of the centerline

["period"] – period of the process

**Output folder path**

The folder where are saved all results and temporary files if deleted processing files are not selected.

In this folder is created layer: "EA\_processes{year\_younger}\_{year\_older}.shp"" represent a spatial layer union among two consecutive time horizons (younger year and older) with in-channel processes information stored in attribute table:

["y\_{younger/older year}"] – year of channel polygon (null/NODATA value is not presented)

["TYP\_{younger/older year }]" – two main landforms for specified time horizon: “channel” and “island”

["EA"] – in-channel process of erosion or accumulation:

“erosion" – erosion of floodplain

"deposition" – deposition in the form of the new floodplain

"island\_erosion" – in-channel erosion of the island

“island\_deposition" – in-channel deposition in the form of the new island

"stable" - without changes

["SIDE\_{ younger/older year }"] – orientation of the process in the direction of the centerline for individual year

["direction"] – final orientation of the process (LEFT and RIGHT) based on the orientation of the centerline for period a younger – older year

["period"] – period of the process

**Input channel polygons**

Channel polygons with information about the year are stored in the attribute table field. The name of this field is the same for all channel polygon layers.

Channel polygons represent vectorised active channels with water areas and gravel bars and must be one polygon object without side tributaries. Polygon objects can contain doughnut hollows, which are islands.

**Input centerline lines**

Centerline line features with information about the year are stored in the attribute table field. The name of this field is the same for all centerline layers.

Centerlines can be calculated in the module M1\_centerline or vectorised manually with the year stored in the attribute table. The centerline is a line feature, oriented in the direction of flow and cannot be multiline.

**Channel polygons year field name**

Name of the field where information about a year is stored in the attribute table.

**Centerline year field name**

Name of the field where information about a year is stored in the attribute table.

**Segment layer (layer from M2)**

Segmentation polygon from module M2 or manually vectorised. The polygon must cover all unions of polygons and should contain longitudinal segments for statistical analyses.

If is segmentation layer is uploaded, statistical analyses based on the longitudinal segments are calculated, and in the output folder is a saved polygon ("EAsegments\_\_{younger\_year}\_{older\_year}.shp).

**Delete processing files**

Check if you want to delete processing files. The default value is FALSE.

In the output folder, saved copies of polygons (CH\_{year}.shp), polygons without hollows (POL\_{year}.shp), polygons with in-channel (channel or island) information (EA\_island\_{year}.shp), and union polygon between two consecutive horizons (UNI\_{younger\_year}\_{older\_year}.shp) are preserved.

**Module 4**

**M4\_FloodplainStat**

**Summary**

Generate floodplain age map (FAM), height above channel (DED) and vegetation canopy height model (CHM). Adding segments from Modul2 creates a statistic file about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

1) If all layers (DEM, flowpath and DSM) are uploaded:

"fam\_layer.shp" - a spatial layer union among all-time horizons with [“FAM”] field stored information about the year of channel position

“DED.tif” – detrended elevation model representing height above channel

“veget\_CHM.tif” – reclassify vegetation (envelope if also other objects are in DSM model)

“M4stattistics\_all.shp" – layer with all statistical information about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

attribute field table:

["FAM"] – the year of the channel polygon

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

["e\_{MIN, MAX, RANGE, MEAN, STD, SUM}]" –zonal statistics for floodplain elevation (DED)

["v\_{MIN, MAX, RANGE, MEAN, STD, SUM}]" –zonal statistics for vegetation height from Canopy Height Model (CHM)

2) If only DEM and flowpath are uploaded:

"fam\_layer.shp" - a spatial layer union among all-time horizons with [“FAM”] field stored information about the year of channel position

“DED.tif” – detrended elevation model representing height above channel

“M4stattistics\_DED.shp" – layer with all statistical information about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

attribute field table:

["FAM"] – the year of the channel polygon

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

["e\_{MIN, MAX, RANGE, MEAN, STD, SUM}]" –zonal statistics for floodplain elevation (DED)

3) If DEM, flowpath and DSM are NOT uploaded:

"fam\_layer.shp" - a spatial layer union among all-time horizons with [“FAM”] field stored information about the year of channel position

“M4stattistics\_FAM.shp" – layer with all statistical information about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

attribute field table:

["FAM"] – the year of the channel polygon

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

**Output folder path**

The folder where are saved all results and temporary files if deleted processing files are not selected.

In this folder is created layer:

1) If all layers (DEM, flowpath and DSM) are uploaded:

"fam\_layer.shp" - a spatial layer union among all-time horizons with [“FAM”] field stored information about the year of channel position

“DED.tif” – detrended elevation model representing height above channel

“veget\_CHM.tif” – reclassify vegetation (envelope if also other objects are in DSM model)

“M4stattistics\_all.shp" – layer with all statistical information about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

attribute field table:

["FAM"] – the year of the channel polygon

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

["e\_{MIN, MAX, RANGE, MEAN, STD, SUM}]" –zonal statistics for floodplain elevation (HACH)

["v\_{MIN, MAX, RANGE, MEAN, STD, SUM}]" –zonal statistics for vegetation height from Canopy Height Model (CHM)

2) If only DEM and flowpath are uploaded:

"fam\_layer.shp" - a spatial layer union among all-time horizons with [“FAM”] field stored information about the year of channel position

“DED.tif” – detrended elevation model representing height above channel

“M4stattistics\_hach.shp" – layer with all statistical information about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

attribute field table:

["FAM"] – the year of the channel polygon

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

["e\_{MIN, MAX, RANGE, MEAN, STD, SUM}]" –zonal statistics for floodplain elevation (HACH)

3) If DEM, flowpath and DSM are NOT uploaded:

"fam\_layer.shp" - a spatial layer union among all-time horizons with [“FAM”] field stored information about the year of channel position

“M4stattistics\_FAM.shp" – layer with all statistical information about the longitudinal position, floodplain dating, height above the channel and vegetation height statistics of the floodplain.

attribute field table:

["FAM"] – the year of the channel polygon

["Distance"] – the field with interval value in meters

["ID\_SEQ"] – spatial sequence upstream (upstream form centerline orientation)

**Input channel polygons**

Channel polygons with information about the year are stored in the attribute table field. The name of this field is the same for all channel polygons layers.

Channel polygons represent vectorised active channels with water areas and gravel bars and must be one polygon object without side tributaries. Polygon objects can contain doughnut hollows, which are islands.

**Channel polygons year field name**

Name of the field where information about a year is stored in the attribute table.

**Digital elevation model (DEM generated from ground point)**

Raster of the DEM

**Digital surface model (DSM generated from ground point and vegetation point)**

Raster of the DSM without anthropogenetic objects.

**Flow centerline of the channel**

Line feature generated in the position of the channel on the digital elevation model (DEM). The position of the flow path is important to generate surface-represented water level form, which is calculated height above the channel.

**Segment layer (layer from M2)**

Segmentation polygon from module M2 or manually vectorised. Polygon must cover all unions of polygons and should contain longitudinal segments for statistical analyses with the attribute fields [“Distance”] and [“ID\_SEQ”].

**Delete processing files**

Check if you want to delete processing files. The default value is FALSE.

In the output folder, saved copies of polygons (CH\_{year}.shp).