Salzburg R for spatio-temporal handling of moving polygons 2021 Background & Introduction 2016 Data cubes allow handling and analysing spatio-temporal data as raster or vector. I propose using vector data cubes (VDC) to structure polygons with 2015 changing geometry and move over time. mplementation 2013 The concept¹ is implemented in R using {stars} and {cubble}. Temporal table 2010 summary geometry POINT (...) POINT (...) id time geometry Spatial table POLYGON (...) POLYGON (...) POLYGON (...) summary 2009 POLYGON (...) 12 geometry //ist-column> POLYGON (...) POLYGON (...) POLYGON (...) †1 Typhoon Morakot POLYGON (...) POLYGON (...) POINT(...) POLYGON (...) POLYGON (...) POLYGON (...) 2 POINT(...) 2008 Array format Tabular format CRAN 0.3.0 CRAN 0.6-5 install_github("r-spatial/stars") () install_github("huizezhang-sherry/cubble") 2005 vdc |> mutate(area = st area(geometry)) vdc |> face temporal() |> mutate(diff = difference(area)) stars object with 2 dimensions and 2 # cubble: key: id, index: datetime, long form attributes 2004 # temporal: 2021-03-20 - 2021-09-30, has gaps! attribute(s): # spatial: x, y, geom sum [POINT [m]] area [m^2] geometry MULTIPOLYGON: 2 id datetime geometry area diff Min. : 54517 <int> <dttm> <POLYGON [m]> 1st Qu.: 287810 POLYGON :28 [ha] [ha] 2001 epsg:3057 Median : 963505 1 2021-03-20 ((339233.7 380... 5.45 NA +proj=lcc ...: 0 2021-03-21 ((339159.3 380... 7.41 :1677119 Mean 3rd Qu.:3084240 1 2021-03-22 ((339355.4 380... 13.7 6.26 :4848672 Max. 2000 dimension(s): Common cube operations refsys point from to and data wrangling can be TRUE EPSG:3057 geom sum datetime POSIXct FALSE applied. Spatiotemporal 1998 values analyses can be performed POINT (339860 380008) geom sum datetime 2021-03-20, ..., 2021-09-30 with {sf} and {tsibble}. 1996 STAMP categories Further integration Disappearance Contraction STAMP² allows change analysis between 1994 Stable Expansion polygons, including longer time series. Generation VDC data structures can be integrated 1992 with these analyses using {stampr}. LEV1 LEV2 Butangbunasi Landslide 400 -1990 Contraction Expansion 300-Stable 1989 Area 200-1984 008-2009 100-Landslide area [ha] 300 100 200 1990 2000 2010 2020

Lorena Abad | Department of Geoinformatics - Z_GIS | University of Salzburg | <u>lorena.abad@plus.ac.at</u>

¹ Abad, L. et al. 2024. "Vector data cubes for features evolving in space and time". AGILE GIScience Series. 5 (16). DOI: 10.5194/agile-giss-5-16-2024

² Robertson, C. et al. 2007. "STAMP: Spatial–Temporal Analysis of Moving Polygons". Journal of Geographical Systems 9 (3): 207–27. DOI: 10.1007/s10109-007-0044-2