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Session: 3

Open Source Google Earth Platform for Computation of Heat Wave Indicators

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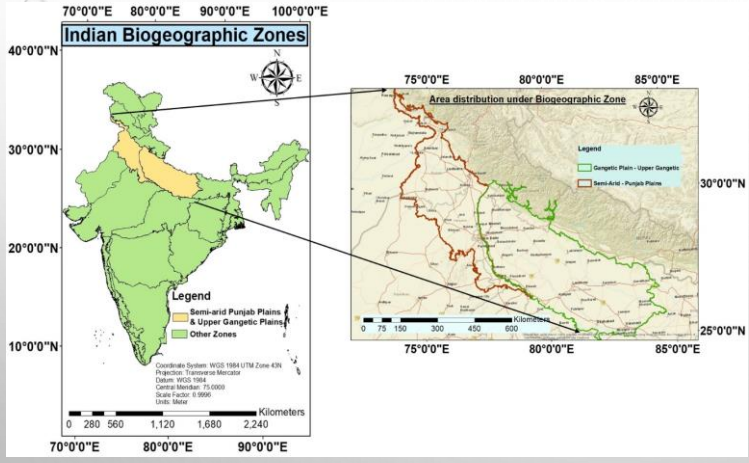
INTRODUCTION

- Heat Wave – extreme weather event- leading to human mortality
- Heat wave study requires processing of large amount of temporal data
- Ground observation data – lacking spatial variability
- Satellite collect large volume data – handling is a hectic task
- Google introduced open source platform – Google Earth Engine (GEE)
- Large volume of analysis ready daily temperature data – available on GEE – employed to compute heat wave indicators

Study Area and Datasets Used

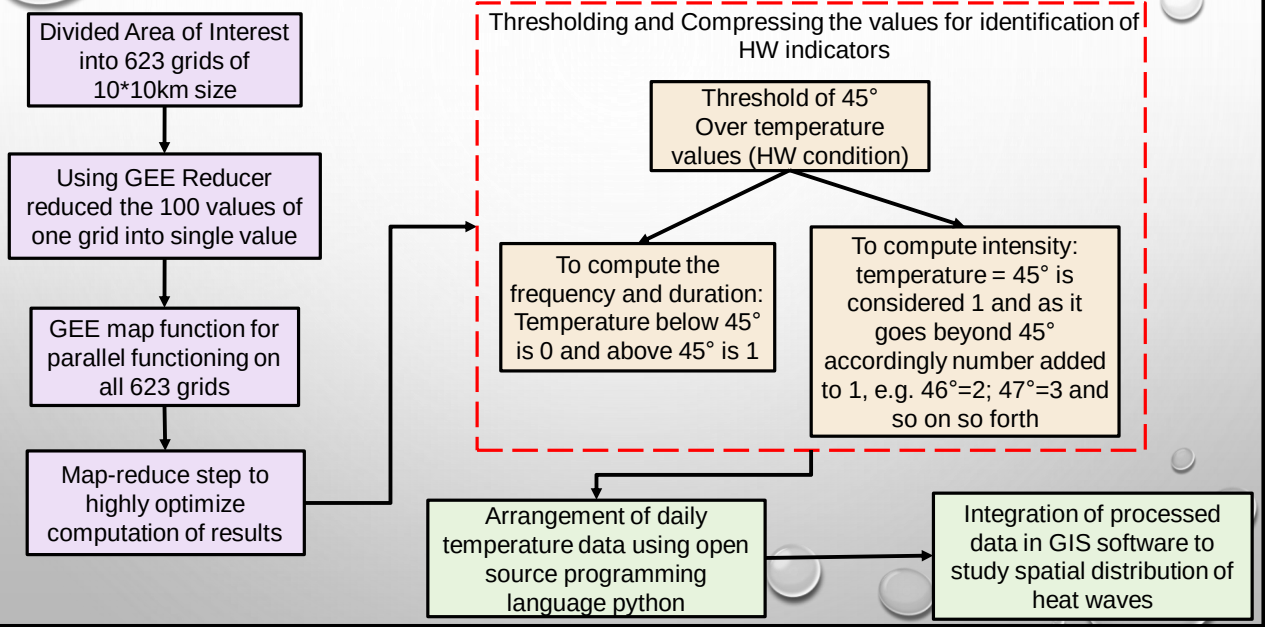


- Two biogeographic zones of Northern India
- Home to large number of Indian population
- Witnessed massive heat wave events in last decade

Datasets Used

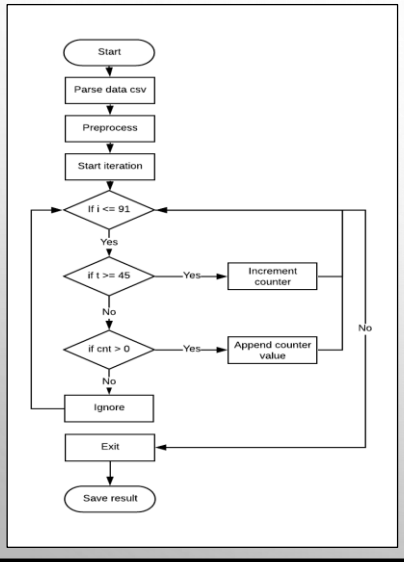
- Aqua Land Surface Temperature and Emissivity (MYD11A1.006) Daily Global 1km dataset
- Provided by NASA LP DAAC at the USGS EROS Centre - available within GEE in analysis ready format
- Study time period – 1 Apr to 30 Jun for years 2003 to 2019

Methodology

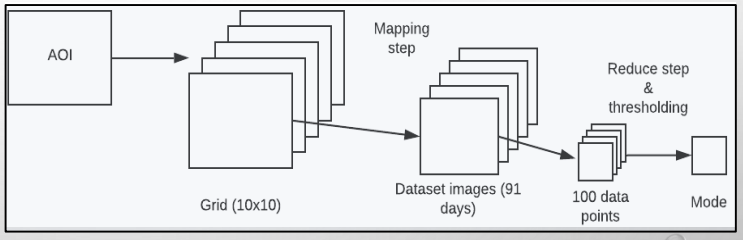


Methodology (Cont.)

Algorithm designed for Heat Wave indicators to be applied on GEE platform



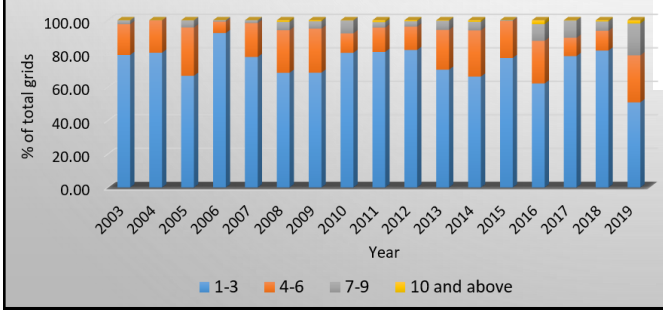
Map-reduce Schematic Representation



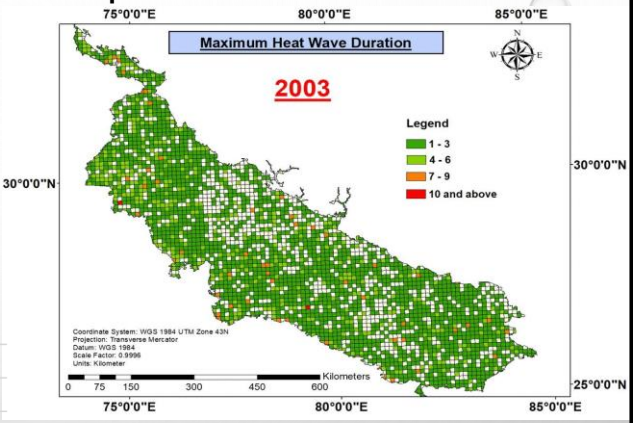
Result

- Total percentage of grids falling in each legend category has been computed to analyze which year is affected more with heat wave
- Similarly all the identified heat wave indices have been computed and its spatial variation has been studied

Maximum Heat Wave Duration



Spatial Distribution from 2003 to 2019



Identified heat wave indices

- Avg. HW Duration
- Max HW Duration
- Cumulative HW Days
- Max HW Events
- Cumulative Warm Days
- Max HW Temp
- Max warm day Temp

Conclusion

- GEE is a platform to perform huge computations on the cloud which would otherwise take weeks or even months for local computation efforts
  - 91 days/year * 623 up-sampled grids/day * 100 native resolution grids / upsampled grid = 5,669,300 grids were computed within 1 hour
  - GEE's parallel computing power is found to be highly efficient to process large volume of data for analyzing spatio-temporal variability of HW condition
  - Open Source platform (GEE) and programming language (python) assisted in identification of Heat wave indicators affectively

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Any Query?

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