



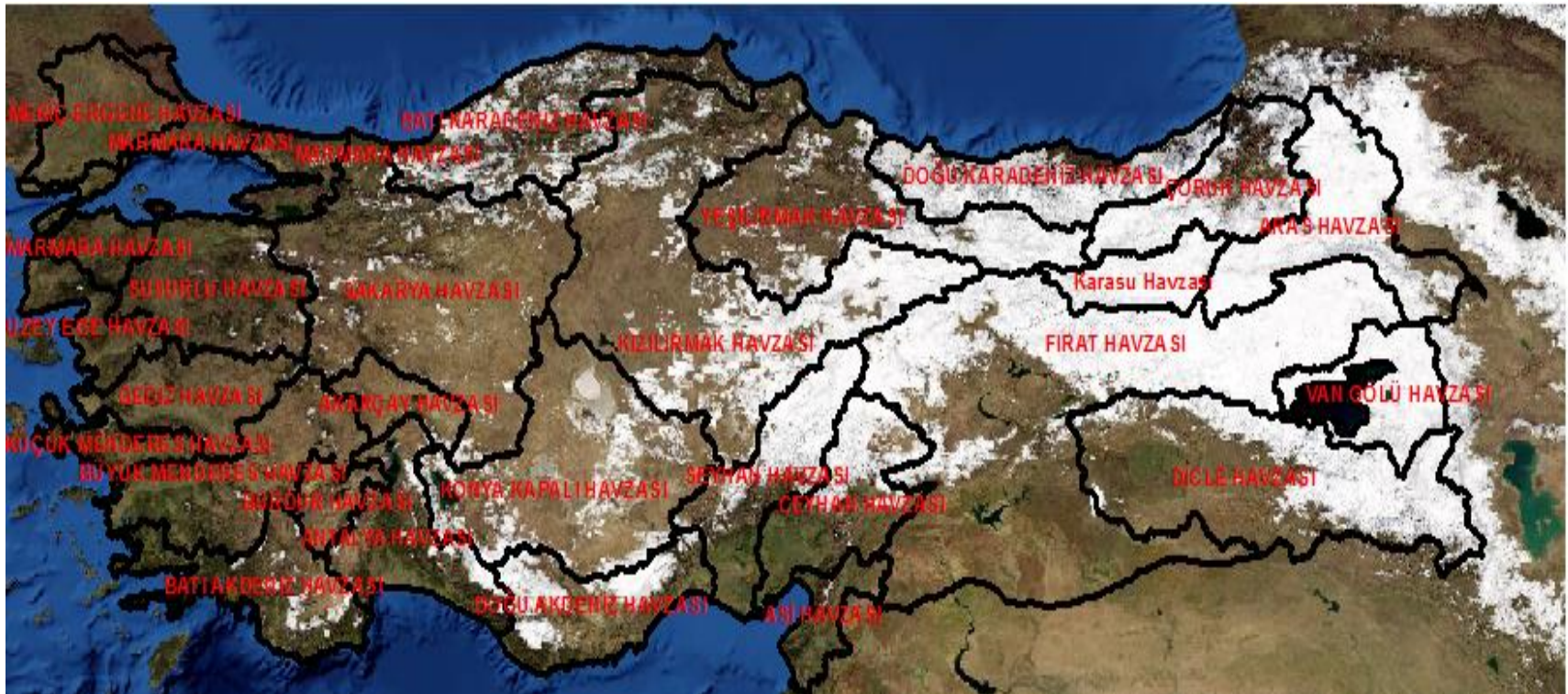
Assessment of Distributed Snow Modeling using Ground and Remote Sensing Data in Mountainous Eastern Turkey

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Snow Potential in Turkey



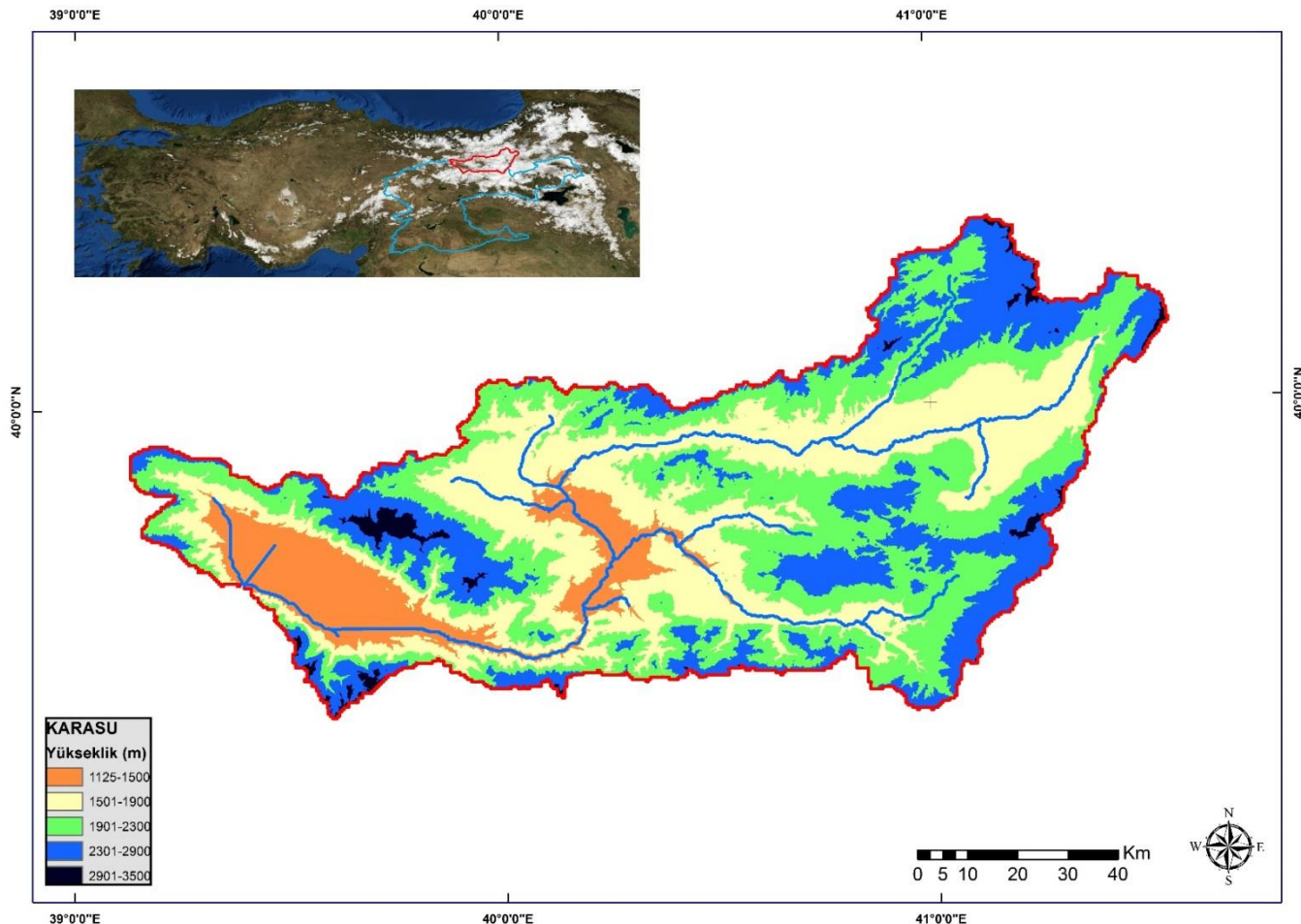
- ❄ Ave. elevation of Turkey ~ 1140 m, snow is frequent
- ❄ Snow stays on ground → Dec. – May. (6 months)
- ❄ Most transboundary rivers are fed by snowmelt

Aim of Study

- ❄ Apply a simple distributed snow model for a snow dominated region in Turkey
- ❄ Validate the results with ground and remotely sensed data

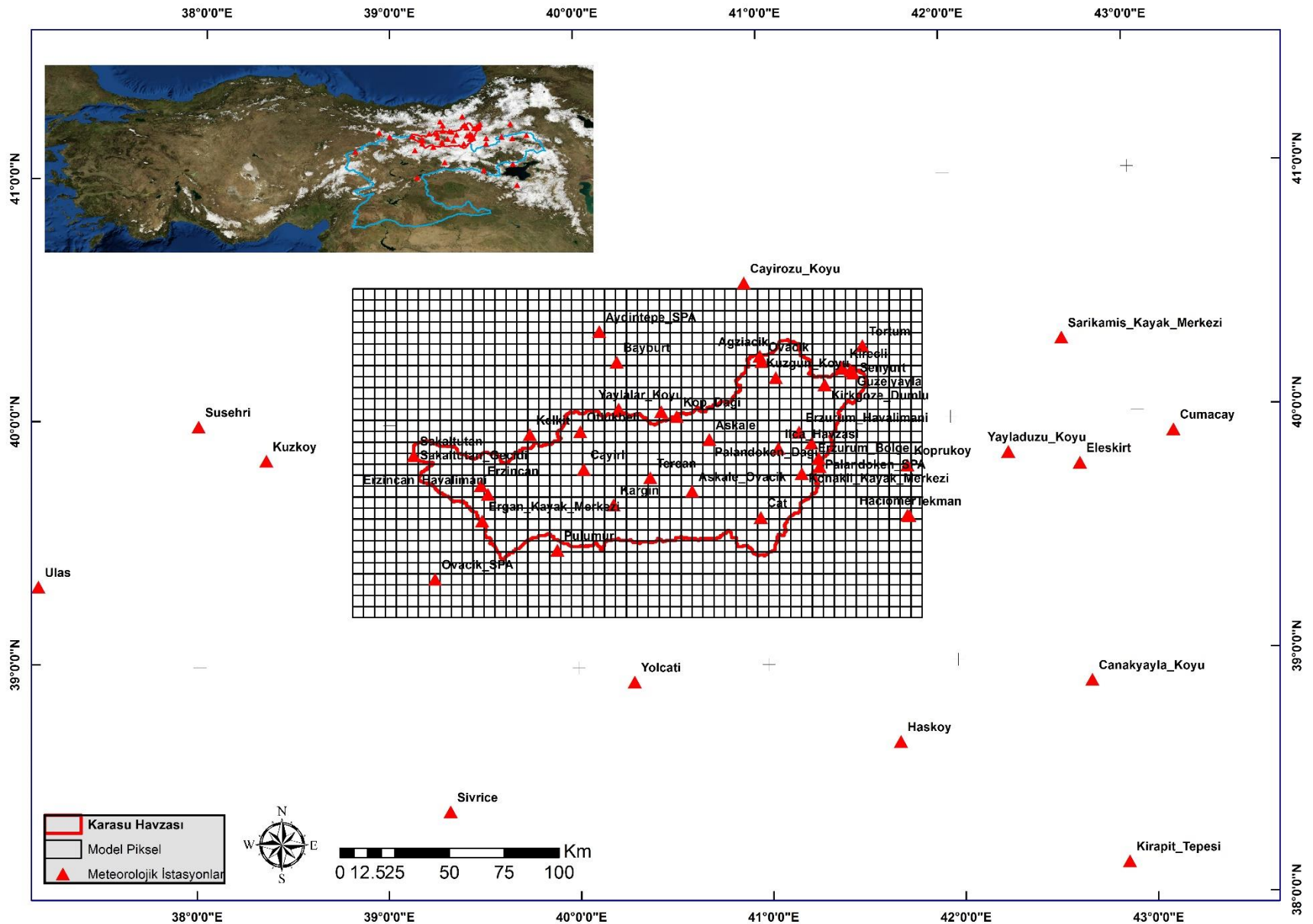
Area of Interest

Eastern Turkey, Sub-basin of Euphrates River (transboundary waters)

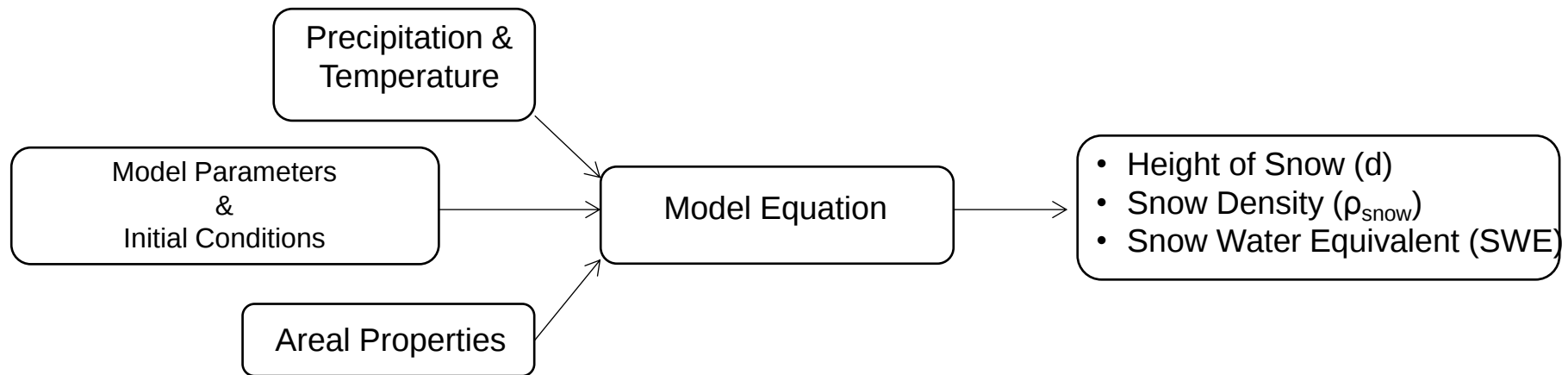


- Area: 10,275 km²
- Elevation Range: 1125 – 3500 m
- Hypsometric Mean: 2000 m
- Mean Slope: 20 %

Station Distribution



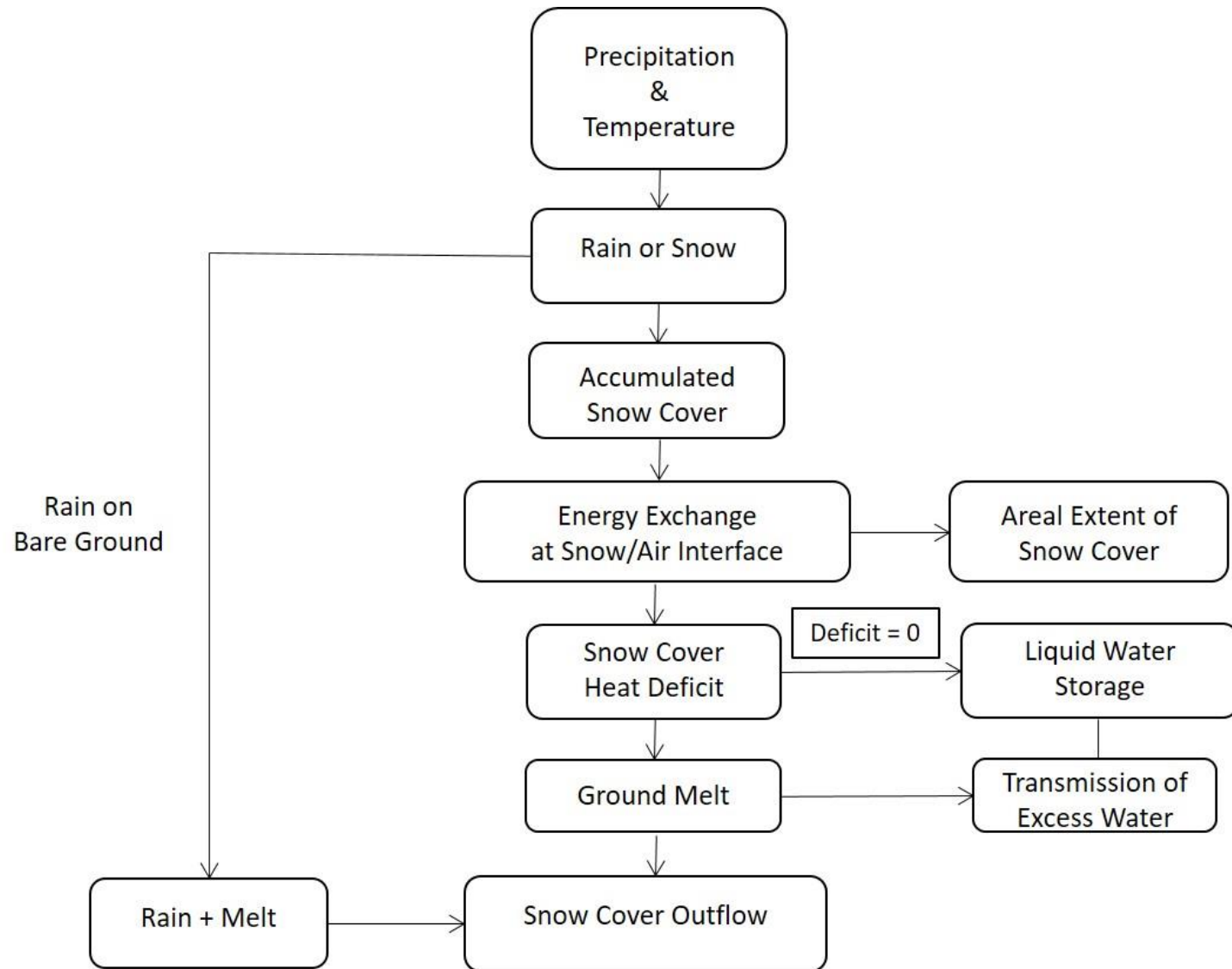
Snow Model – SNOW-17



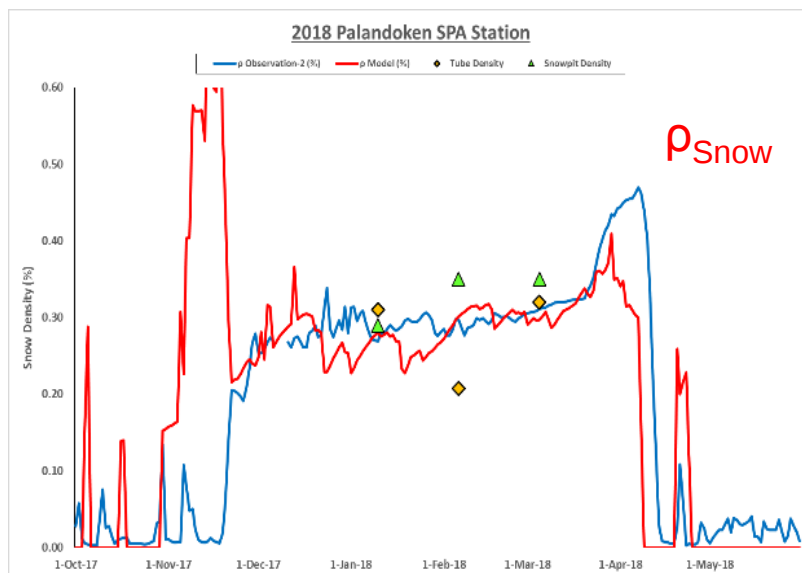
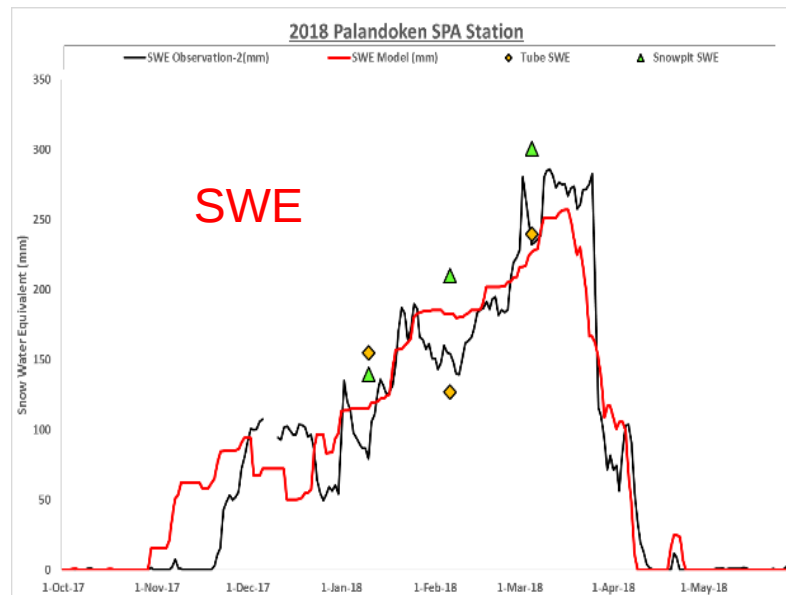
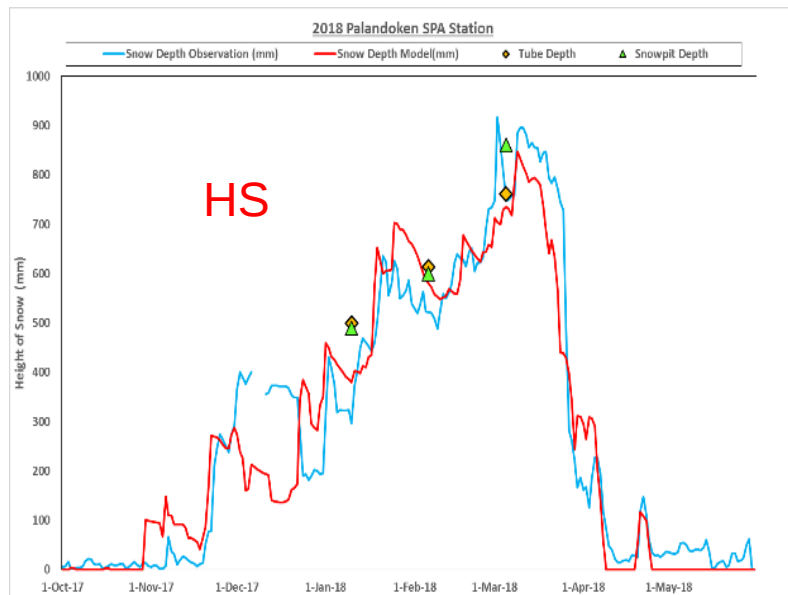
Eric Anderson, 1973

1. Form of precipitation,
2. Accumulation of the snow cover,
3. Energy exchange at the snow-air interface,
4. Internal state of the snow cover,
5. Transmission of water through the snow cover, and
6. Heat transfer at the soil-snow interface.

Snow Model – SNOW-17



Snow Model Calibration



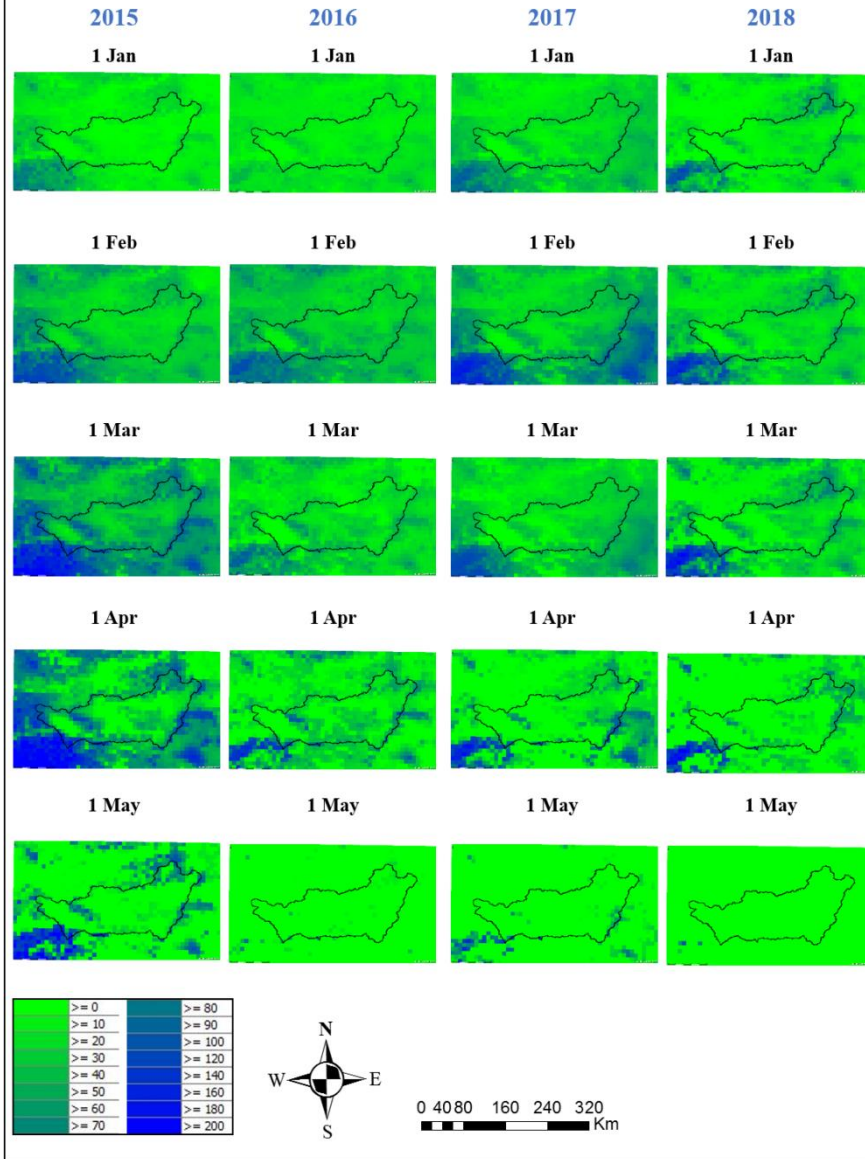
HS : height of snow

SWE : snow water equivalent

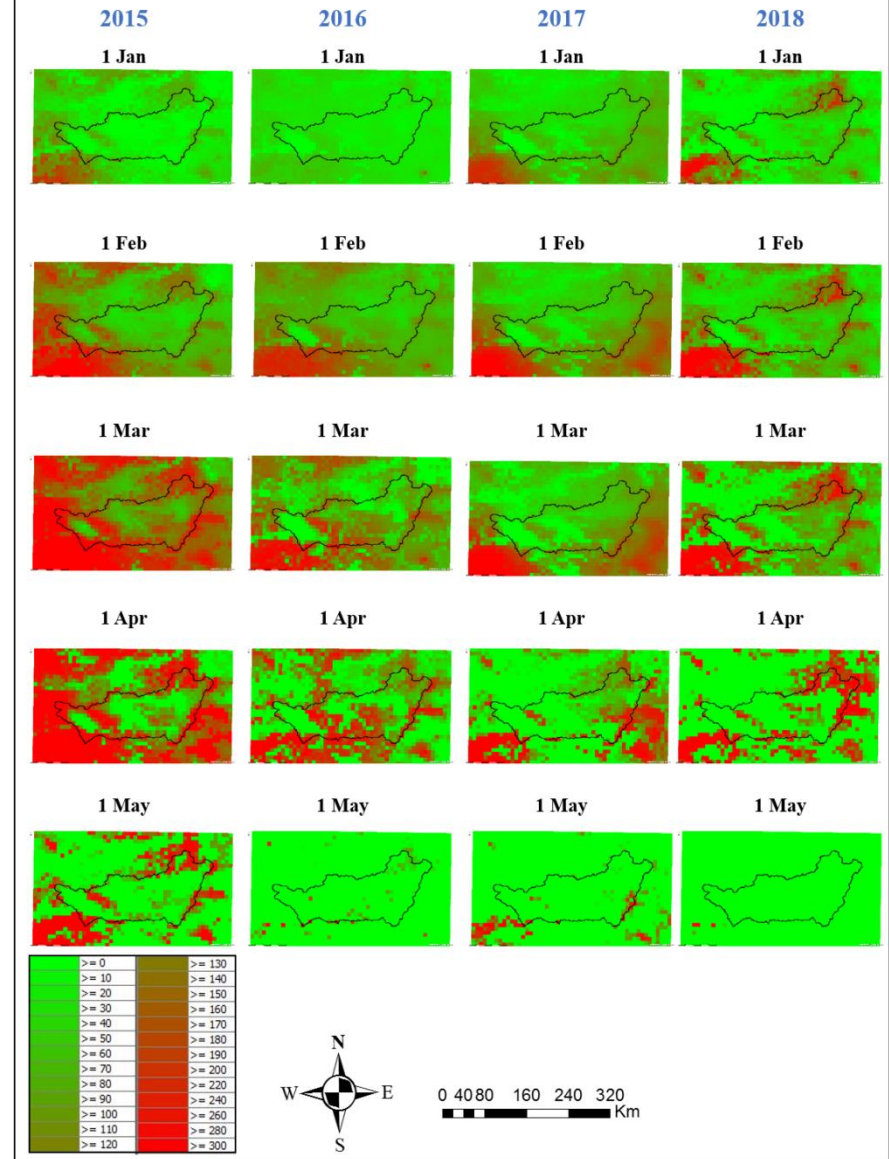
ρ_{snow} : snow density

Distributed Snow Model (2015 - 2018)

2015-2018 Height of Snow (cm) Model Results

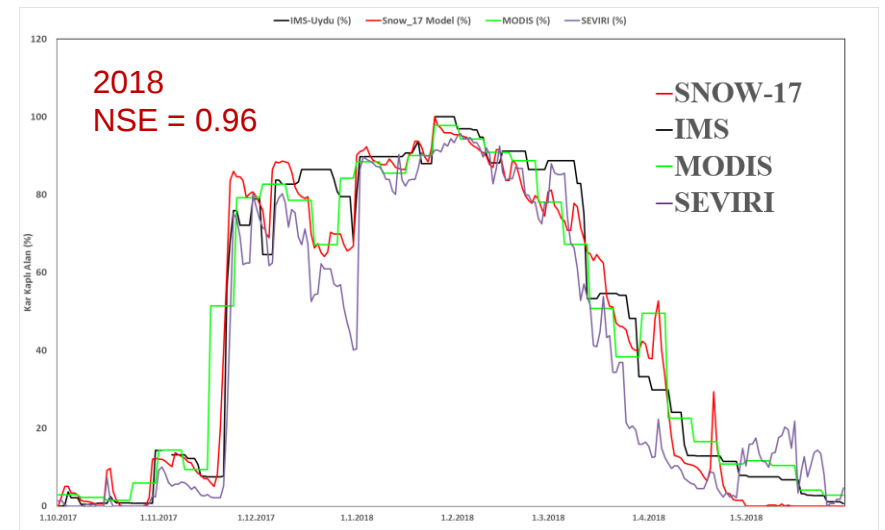
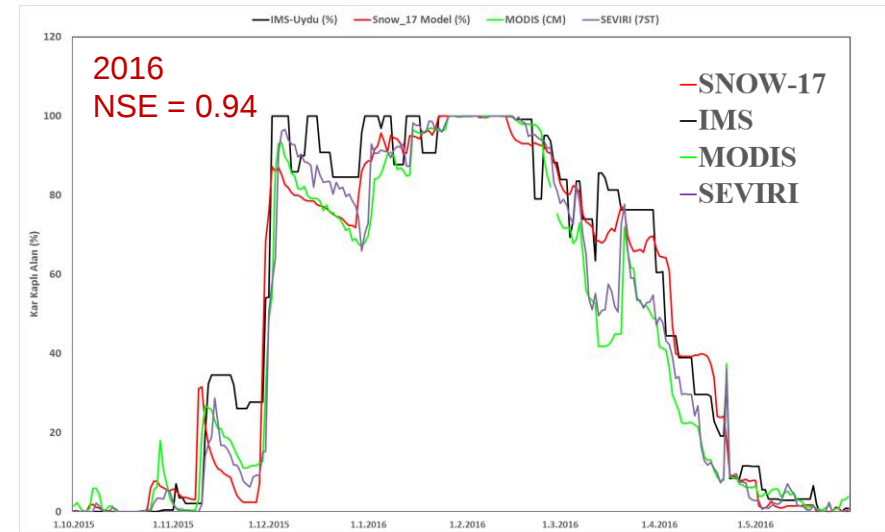


2015-2018 SnowWater Equivalent (mm) Model Results



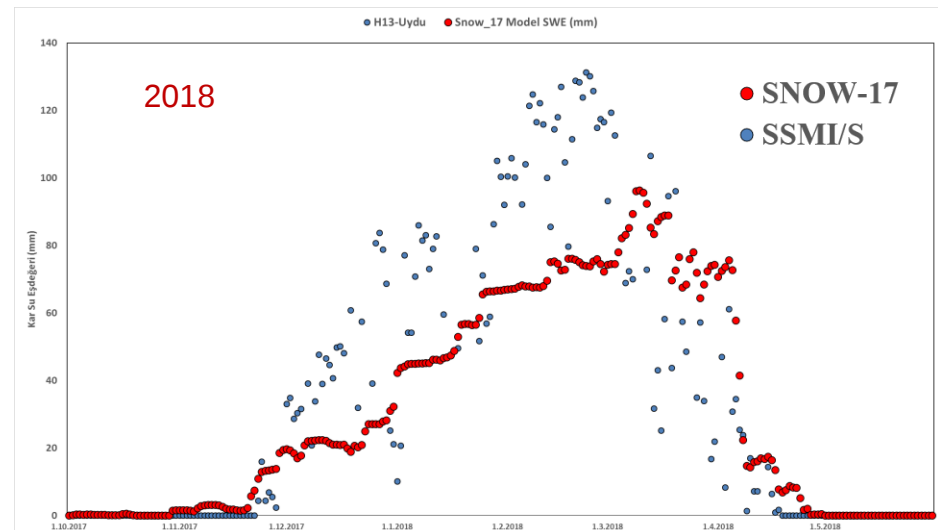
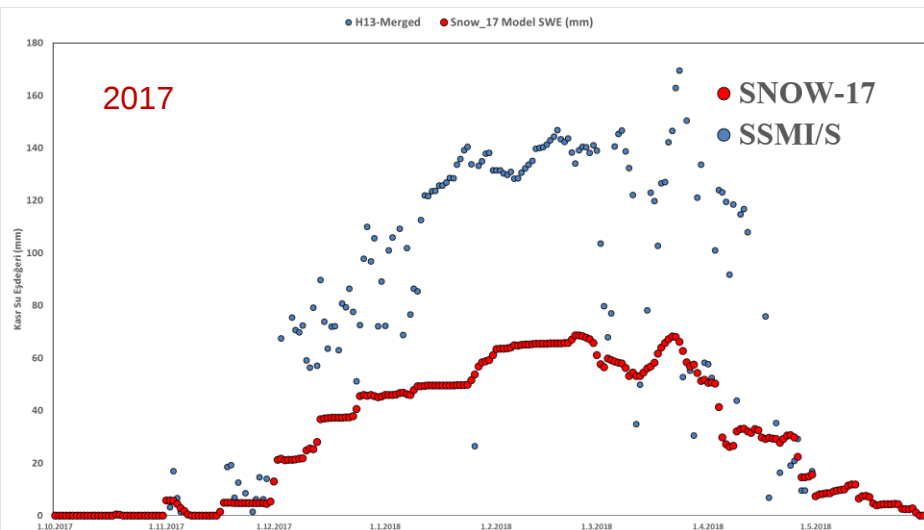
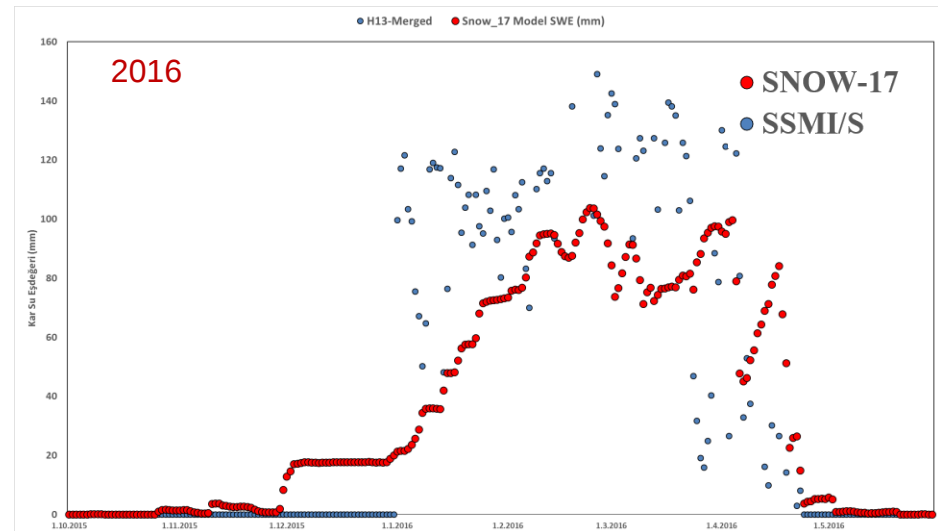
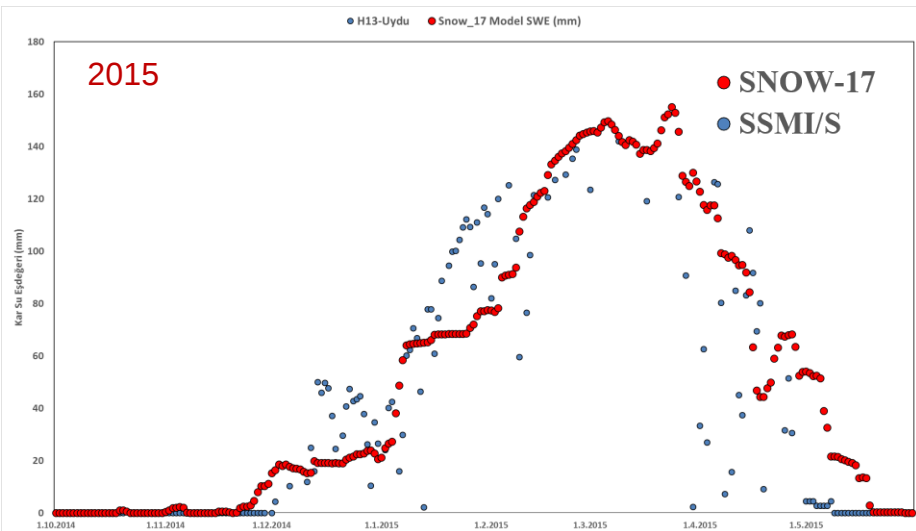
Model Results & Validation

Basin wide Snow Covered Area (SCA) Validation



Model Results & Validation

Basin wide Snow Water Equivalent (SWE) Validation



Conclusions

- First time distributed snow modeling conducted in Turkey

- Calibration: 23 Snotel stations

$$NSE_{ave} = 0.81 \text{ (range 0.49 – 0.96)}$$

- Validation: 17 Snotel stations

$$NSE_{ave} = 0.66 \text{ (range 0.20 – 0.94)}$$

Validation: 3 different RS products used for Snow Covered Area

$$NSE_{ave} = 0.91 \text{ (range 0.82 – 0.95)}$$

- Study shows acceptable results to be utilized for hydrologic modeling and reservoir management.
- In the future, with the setup of more Snotel stations, increase in model performance is expected.

Thank you !!