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Mapping Snow Cover Area in Afghanistan from Property of SNOW Brightness and Wetness using MODIS 2008 data

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Snow is a type of precipitation within the Earth atmosphere in the form of crystalline water ice. Snow is vital water resource, for example, accumulated snow as like solid reservoirs. Agriculture and animal husbandry is relying heavily on Snow melting water. Tourism role of snow is connection with winter tourism and skiing. And other hand heavy snowstorms often bring disaster to animal husbandry.

Given the importance of knowing the distribution of snow, there has been much progress since 1966 when the first operational snow mapping was done by NOAA. In addition, the snow cover itself is a surface condition that affects radiation and water balance determinations that are inputs to hydrological cycle and climate studies. Qualitative and quantitative information on snow cover is needed for hydrological and climatologically modeling and prediction. Satellite data have accounted for major improvements in the production of reliable global snow cover maps.

MODIS Snow and Ice products are available since September 13, 2000 (NSIDC).

Located in the interior of Asia, Afghanistan has the typical arid to semi-arid climate of the Russian Steppes. At 647,456 km2, Afghanistan is the world's 41st-largest country.

Afghanistan weather is characterized by dry hot cloudless summers and severe winters. The areas lying in the northeastern part of the mountains experience sub-arctic conditions having dry, cold winters. The average temperature is approximately12.6 degree.Highest monthly average temperature is 33 degree in July & August. Lowest monthly average temperature is -7 degree in January. Annual precipitation is 316mm. Average annual relative humidity is 56.3% and average monthly relative humidity ranges from 33% in August to 77% in February.

The mapping snow cover area in Afghanistan were analyzed using MODIS /Terra 8-day composite 7-band 500m, 2008 and Landsat ETM+ 30m, 09/17/2006 (Fig.2 shows used data).

Firstly, doing pre-processing for original MODIS 2008 data, such as cloud remove. Secondly, calculate the Brightness and Wetness for each period data.

Brightness=0.4395∗band1+0.5945∗band2+0.2460∗band3+0.3918∗band4+0.3506∗band5+0.2136∗band6+0.2678∗band7

Wetness=0.1147∗band1+0.2489∗band2+0.2408∗band3+0.3132∗band4-0.3122∗band5-0.6416∗band6-0.5087∗band7

Then, according to the snow property, make threshold for brightness and wetness data. There threshold for brightness is more than 4300 and for wetness is morethan-800.

Thirdly, extract snow cover area in Afghanistan from MODIS data

Finally, using Landsat data were validated the snow cover area.

Fig.4 shows the result of Snow cover area in Afghanistan. There White color indicated snow area.

Future work is considered to Snow Cover Mapping in dense forests area.

Keywords: snow mapping, snow brightness, snow wetness, Afghanistan