Using remote sensing for detecting the global impact of climate extremes on vegetation and improving drought monitoring programs

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Drought is an important problem in many areas of the world.
Drought is an important problem in many areas of the world with devastating consequences...

- Is a drought event about to strike?
- Where is it occurring?
- How severe is the drought event?

Drought monitoring & early-warning systems

Can remote sensing provide input?
Drought and Vegetation

Agricultural drought

- low soil moisture contents
- reduced transpiration: plant stress

Result:

- reduced crop production
- vegetation die-off

CAUSED BY

- climate extremes
  - high temperatures (heat waves)
  - shortage of precipitation

REMOTE SENSING?
Drought and Vegetation

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climate extremes high temperatures (heat waves) shortage of precipitation

REMOTE SENSING?
HOW IS LHWM USING REMOTE SENSING?

1. To understand how climate and climate extremes influence vegetation

\[ \text{SAT-EX} \]

2. To improve drought monitoring systems

\[ \text{HYDRAS+} \]

3. To improve early-warning systems for vegetation stress

\[ \text{STR3S} \]
SAT-EX or How Climate Extremes Link to Vegetation Extremes

Impact of climate and climate change on vegetation? What model is ‘correct’? Impact on vegetation?
Use satellite observations to assess past changes in extreme events and their carbon cycle impacts. Use this information to evaluate climate model performance.
SAT-EX or How Climate Extremes Link to Vegetation Extremes

Use satellite observations to assess past changes in extreme events and their carbon cycle impacts. Use this information to evaluate climate model performance.

Statistical analyses and data mining techniques.
SAT-EX or How Climate Extremes Link to Vegetation Extremes

Statistical analyses and data mining techniques

Positive correlations

Negative correlations
HYDRAS+ OR HOW REMOTE SENSING CAN IMPROVE DROUGHT MONITORING

Hydrologic Model

- Field data
- Forcing data

Discharge
Soil moisture

Crop growth models
Drought assessment

Water management

Remote Sensing

Level-1 products
Soil moisture

Microwave image

DA
PP
HYDRAS+ or How Remote Sensing Can Improve Drought Monitoring

Using remote sensing observations to steer hydrologic models

![Diagram showing soil moisture over time with updates marked as large, intermediate, and small updates.]
HYDRAS+ or How Remote Sensing Can Improve Drought Monitoring
Two ongoing BELSPO projects further explore the potential of remote sensing for understanding and mitigating climate impacts on vegetation:

- **SAT-EX** unravels globally climate impacts on vegetation through exploring long-term remotely-sensed datasets
- **Hydras+** develops methodologies for improving drought monitoring systems through incorporating a wide variety of remotely-sensed observations

(Near-)Future research:

- Apply remotely-sensed fluorescence observations to assess vegetation stress and use this for estimating vegetation transpiration
MORE INFORMATION

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