Estimation of Grassland Parameters Using SAR Interferometry and Polarimetry

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- Objective of the study
- Study area
- Satellite data and methods
- Results up to now
- Conclusions

- Detect mowing events of grasslands
- Investigate whether SAR is sensitive to change in grass biophysical parameters



- Grasslands cover approximately one quarter of the world's land surface
- Maintenance is usually supported by the authorities remote sensing can be used for verifying subsidy claims
- And it is an interesting topic from the scientific point of view!





6/19

Radarsat 2 (x13)

- ▶ 7.5 x 7.5 m
- HH, HV, VH, VV
- COSMO-SkyMed (x19)
 - ▶ 3 x 3 m
 - ► HH
- TanDEM-X (x12)
 - ▶ 3 x 3 m
 - HH, VV

Temporal coverage



T - TanDEM-X; R - Radarsat 2; C - COSMO-SkyMed

| Field | Area [ha] | min/max | min/max | min/max |
|-------|----------------|---------|-------------------|-------------|
| Nr. | (nr of pixels) | height | biomass, | soil moist. |
| | | [cm] | wet and (dry) [g] | [%] |
| TP1 | 13.0 (29443) | 10/70 | 60/727 (9/180) | 4/35 |
| TP2 | 24.9 (56522) | 10/80 | 51/857 (12/165) | 7/35 |
| TP3 | 4.8 (11005) | 0/60 | 0/880 (0/180) | 8/39 |
| TP4 | 9.3 (21134) | 10/120 | 61/615 (10/135) | 7/46 |
| TP5 | 4.0 (9012) | 0/180 | 0/1166 (0/325) | 9/53 |
| TP6 | 9.1 (20687) | 5/100 | 23/1110 (5/160) | 6/40 |
| TP7 | 11.3 (25635) | 0/60 | 0/866 (0/150) | 2/30 |
| TP8 | 12.3 (28703) | 5/70 | 47/857 (8/100) | 2/38 |
| TP9 | 10.1 (22868) | 10/70 | 41/1305 (10/230) | 4/30 |
| TP10 | 10.9 (24753) | 7/80 | 56/876 (15/305) | 2/32 |
| TP11 | 12.6 (28565) | 3/75 | 101/1830 (15/580) | 6/39 |

- Polarimetry: investigates how objects backscatter signals of different polarization
- Interferometry: in this case it provides a measure of stability

- Entropy H: one dominant scatterer (low entropy), several similar scatterers (high entropy)
- ▶ Dominant scattering angle ā: from surface (ā = 0°), volume (ā = 45°), dihedral (ā = 90°)
- HH/VV intensity ratio
- coherence between HH and VV channels
- ► T₁₂ coherence: between HH+VV and HH-VV polarimetric channels

Interferometric coherence

- Interferometric coherence: measure of stability
- main sources of decorrelation: geometric and/or temporal



PolSAR results



Modeling: coherence



Modeling: entropy



InSAR: biomass





- ► HH/VV coherence magnitude and H2^α entropy are the most sensitive parameters to mowing events
- Grass height is not predictable

- Coherence is also dependent on vegetation ground cover
- When a certain level of cover is reached, total decorrelation occurs
- Grass height is not predictable
- However, it might be possible to detect mowing events (if certain conditions are met)

Thank you for your attention! Questions?



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