Hyperspectral remote sensing and analysis of intertidal zones: A contribution to monitor coastal biodiversity

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GI_Forum Salzburg

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Overview:

Hyperspectral remote sensing and analysis of intertidal zones

- 1. Introduction:
 Research goals
 and study area
- 2. Data and analysis approach
- 3. Results:
 Biotope classification
 and data accuracy
- 4. Perspectives of GIS-RS-based environmental monitoring





Study area







Helgoland Northern Intertidal















Working scheme

Data Collection

- Hyperspectral Aircraft Survey with ROSIS
- GPS-supported Groundtruthing

Pre-Processing

 Radiometric and Geometric Correction

Hyperspectral Image

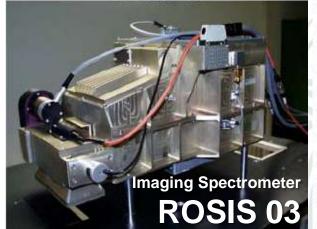
- **Analysis**
- Spatial Data Reduction: Minimum Noise Fraction-Transformation
- Spectral Data Reduction:
 Pixel Purity Index
- Endmember Selection:
 n-Dimensional Visualizer
 Compilation of a Spectral Library
- Final Classification:
 Spectral Angle Mapper

Monitoring

- Integration of Remote Sensing Data in Geographical Information Systems
- Establishment of a standardised long-term observation system



Data



Scanning Pushbroom Spect. Coverage 0,43 - 0,86 µm Bandwidth FOV **IFOV**

4,0 nm ±8°

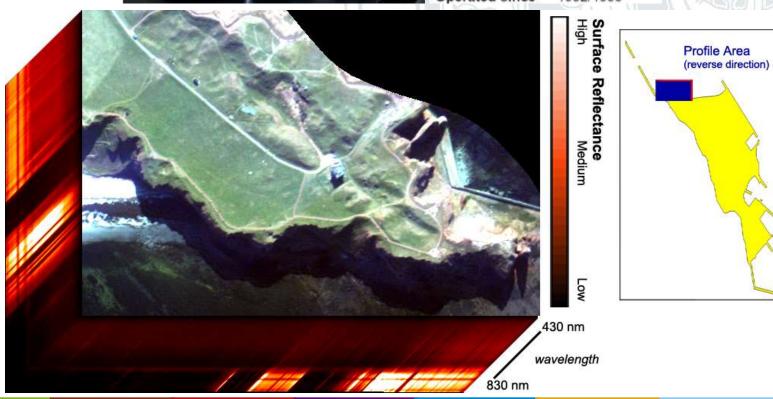
0,56 mrad

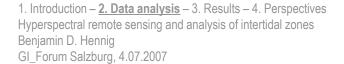
Px / Line 512 115 No. of Bands

Scan Frequ. 88 Hz 14 Bit Digitisation

Int. Spec. Calibr. Calibration

Operated since 1992/1999

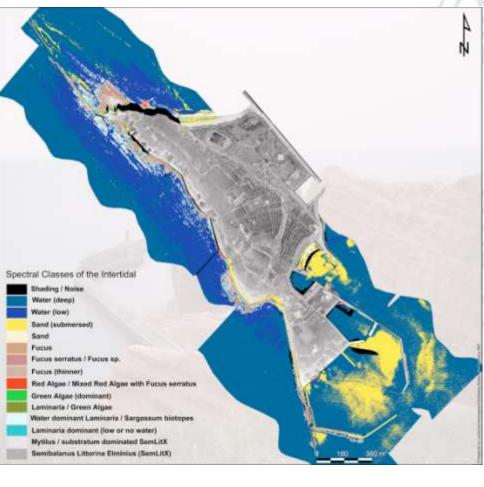


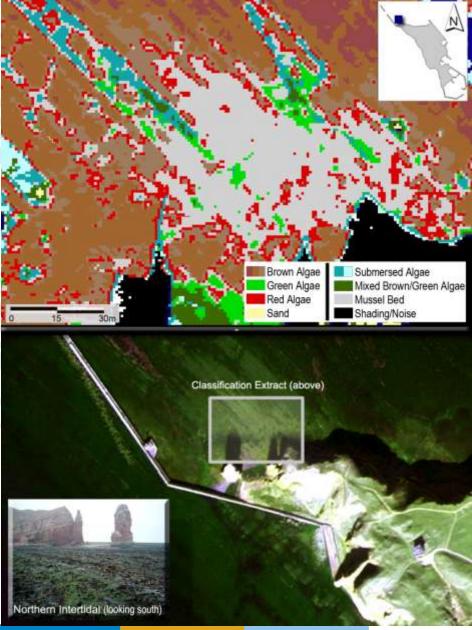






Biotope classification











Biotope classification Selected Spectral Plots SemLitX Mytilus Reflectance (Stacked - Offset for Clarity) Green Algae Red Algae Brown Algae Brown Algae Submersed Algae Green Algae Mixed Brown/Green Algae Red Algae Mussel Bed Shading/Noise Sand Mastercagus (Mas Fucus serratus (Fser) Unknown MasGreenargae degraded Accumulation MasSent.XX FserEnteromorpha Ascophyllum FserRedalgae RhoFsert.dio Corralina (Cor) FserRhodothamniella Eminus (Sent.00) Enteromorpha (Ent) Fucus spiralis FucusLaminaria No vegetation. **Fucus** Undefined Halidrys (Hal) FucusEntPorphyra Sargassum FucusRedalgae SargarounLamnan Mylligit Sucurifiedal



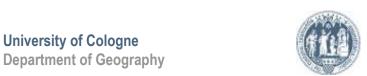


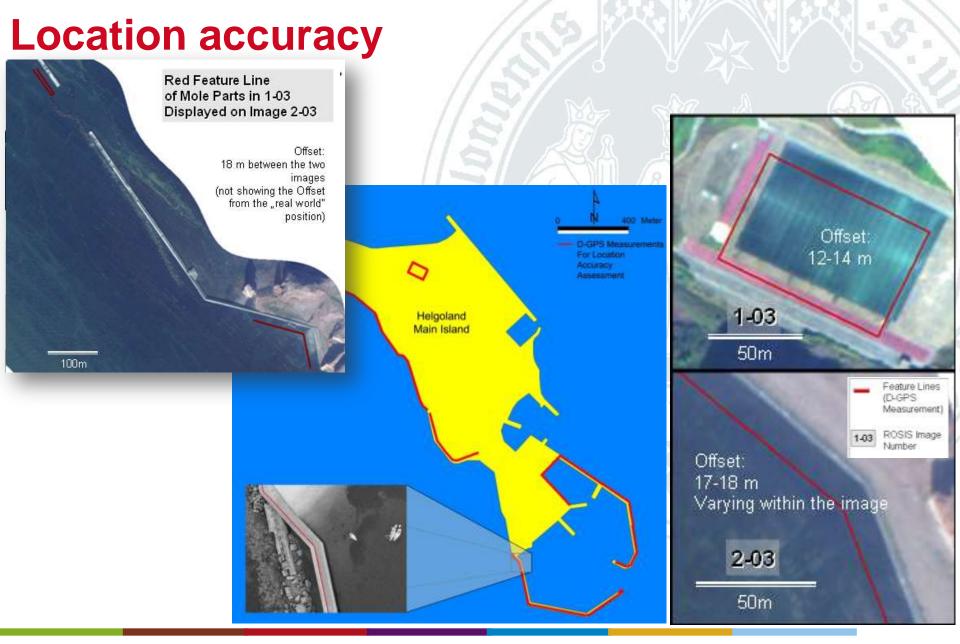
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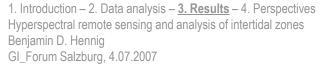
Thematic accuracy

	,			<u> </u>		4	100	AW/			A 60x	
	Reference Data											
ta		No Vegetation	Brown Algae	Dense Brown Algae	Red Algae	Green Algae	Kelp	Vegetated Channels	Mussel bed	Barnacles	Total	User's Accuracy %
	No Veget.	9		-				6			15	60
Data	Brown Algae		19		9			4			32	59,4
Classified	Dense Brown Algae			38	4	_					42	90,5
<u> 3</u>	Red Algae				24	<u> </u>	ı	2			26	92,3
	Green Algae					18					18	100
	Kelp					3	17	8	-		28	60,7
	Vegetated Channels					1	3	20			24	83,3
	Mussel bed								27	9	36	75
	Barnacles	3							12	30	45	66,7
	Total	12	19	38	37	22	20	40	39	39	266	76,4
	Producer's accuracy %	75	100	100	64,9	81,8	85	50	69,2	76,9	78,1	<u>75,9</u>

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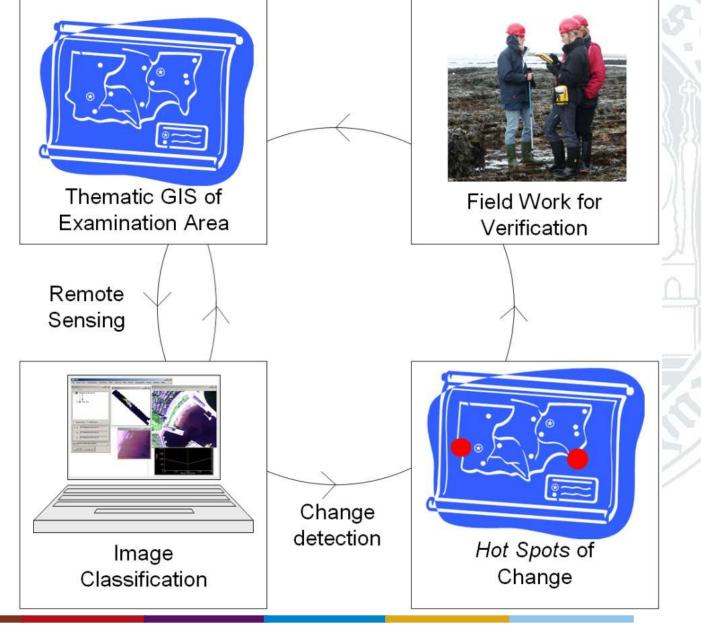








Field work

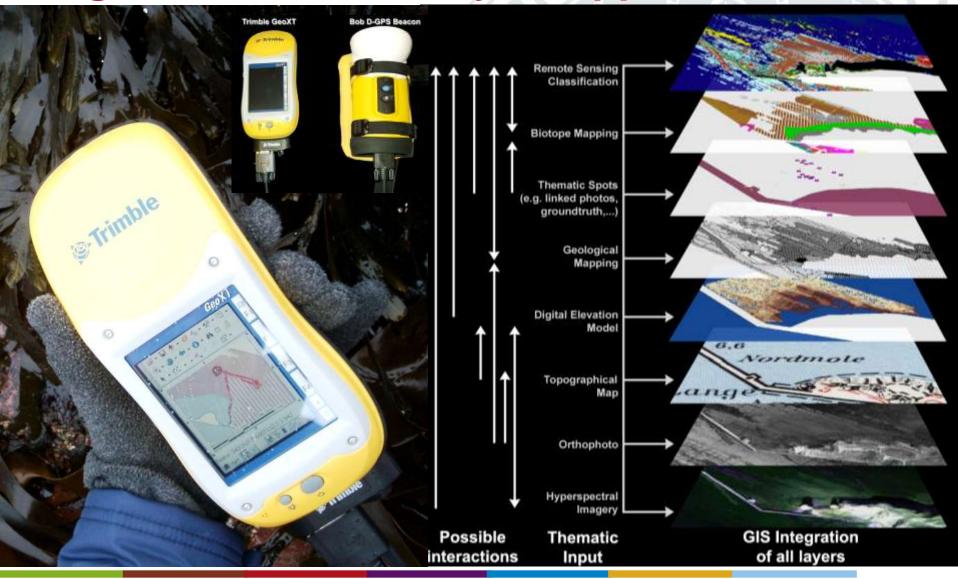


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Integrated GIS-RS-analysis approaches



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Thanks for your attention!



