

EO_Regions_Science

Basic Research In Support to EO_Regions!

A. Orban

Université de Liège – Centre Spatial de Liège
Coordinator

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1. Project Context : EO_Regions!

- ❑ A project lead by SPACEBEL to develop innovating services based on :
 - An integrated infrastructure for BIG DATA storage and easy, quick and flexible access.
 - New methodologies and services for dynamical monitoring of territories based on Sentinel data.
 - A strong expertise to predict service accuracy and ensure correct use of the information.
 - New services targetted to users not expert in EO but interested in the added value of the generated information.
 - Local service implementation allowing the combination and re-use of geospatial data over a territory to increase the added value of existing data.
- ❑ Labelled by Skywin
- ❑ Consortium Agreement signed by all partners
- ❑ Kick-Off Meeting 1 April 2016

WP0 – Coordination

Exemple de services possibles dans EO Régions!	Description
Identification des changements significatifs de la végétation	Identification des coupes rases non-répertoriées dans les zones NATURA 2000
Suivi et quantification du non-reboisement	Identification du (non-)reboisement dans les zones forestières mises à blanc (coupées). Quantification des ressources en bois disponible pour l'industrie.
Monitoring des anciens puits de mine	Mesures des mouvements du sol / affaissements dans les anciens puits de mine
Suivi de la subsidence régionale	Mesures des mouvements du sol lors de forage géothermiques , d'extraction du gaz de schiste – d'une évolution des nappes phréatiques
Surveillance des ouvrages d'art	Mesures des mouvements dans les ouvrages d'art – Support à l'évaluation des risques – Identification des causes
Monitoring des calamités inondations et dégâts de forêts	Estimation rapide des zones touchées Support/contrôle à la gestion des dossiers d' indemnisation
Surveillance des stations permanentes GNSS	Mesures indépendantes des positions des stations permanentes GNSS.
Evolution du bâti	Localisation des nouvelles zones bâties / démolies - Aménagement du territoire - Support pour les mises à jour des cartographies de base
Suivi agricole	Identification des cultures – prévisions des récoltes et des rendements

2. EO_Regions_Science : Project goals

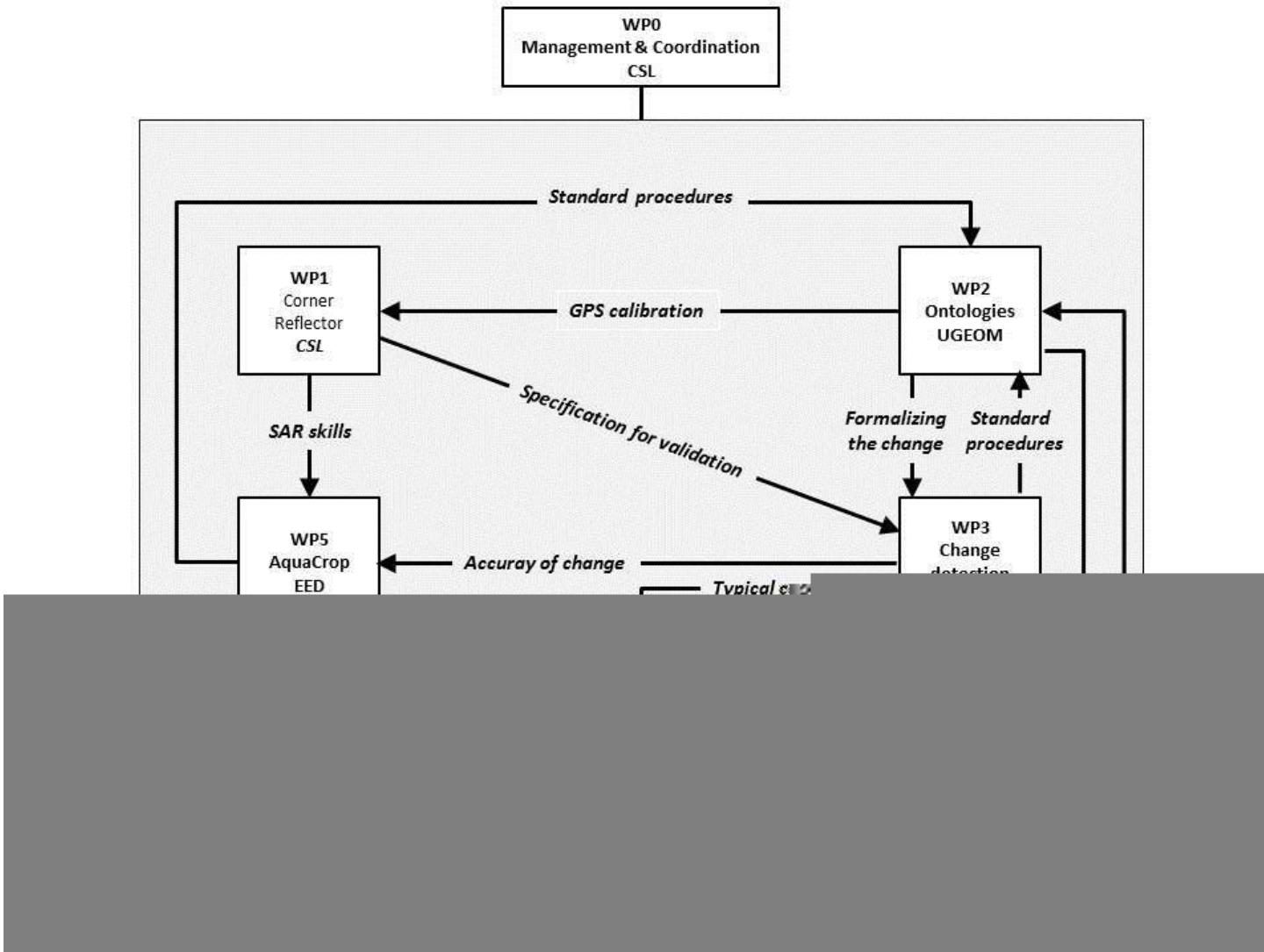
To carry out basic research in support of EO_Regions! to :

- **Consolidate the pillars on which the EO_Regions! proposed services are based.**
- **Facilitate the operationalisation of these services.**
- **Generate original results interesting Belgian remote sensing community outside the EO_Regions! context.**

3. Partnership

Denomination	Acronym	Task(s)
Université de Liège / Centre Spatial de Liège	ULg-CSL	Management and coordination Corner reflector technique
Université de Liège / Unité de Géomatique	ULg-UGEOM	Linking Queries with natural language and a consistency analysis
Université de Liège / Unité Eau, Environnement, Développement	ULg-EED	Crop yield prediction : HR S1 and S2 data assimilation into agrometeorological AQUACROP model
Ecole Royale Militaire	RMA	Change detection
Institut Scientifique de Service Public	ISSeP	In-situ data Methodology for user needs definition

4. WBS and WPD



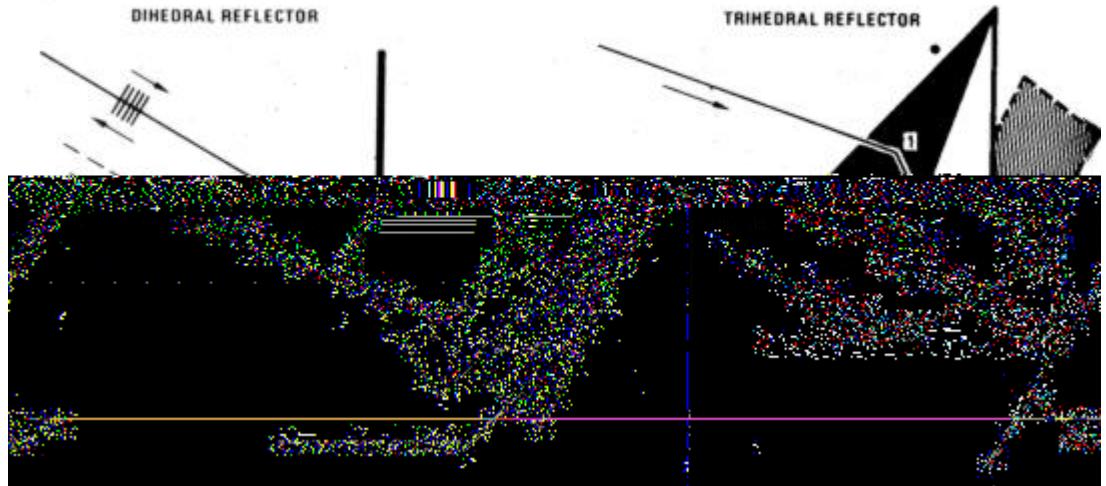
WP 1 : Corner reflector technique (ULg-CSL)

- Measuring ground displacements by differential SAR interferometry requires phase stability « islands » generally referred to as Persistent Scatterers
- Proposed devices for EO Regions! : corner reflectors (CR's)

Tasks : CR research to prepare concept operationalisation, incl. :

- CR specification (baseline : S1 imaging)
- CR design
- CR testing and evaluation
based on S1 images

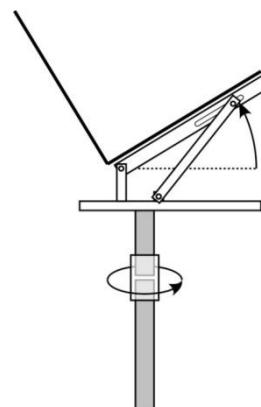
CORNER REFLECTORS



WP 1 : Corner reflector technique (ULg-CSL)

Basic idea :

- To place CR's on top of measurement rods, to identify them in the radar images over the ROI, and to measure the corresponding differential phase.
- Set other CR's that can be considered as a fixed reference in the zone of interest. At least three supplementary CR's are needed to subtract atmosphere and orbital residuals.
- The topographic reference can be obtained by GPS measurements for each CR at the moment of their installation.





WP 3 : Change detection (RMA)

- Develop and analyse the efficiency of joint radar (SAR) and optical hypertemporal change indicators & time-series analysis tools, taking into account the spatial coherence.
- Develop a toolbox of generic change indicators that can be applied in many specific contexts.
- Evaluate the toolbox on specific applications (see WP4 & WP5).



WP6 : Dissemination

- Presentation of conference papers
- Publications in peer-reviewed journals
- Organisation of a final workshop at Belspo premises
- Participation to EO_Regions user's meetings

The **test sites** will be chosen among those selected by the end-users of the EO_Regions! Project for validating the test-cases. Depending on application :

- To assess **subsidence monitoring** capabilities, **Hainaut** has been selected in the context of geothermal drilling, and the **basin of Liège-Charleroi** has been designated to assess subsidence monitoring due to past industrial sub-surface mine exploitation.
- For **change analysis and detection**, the **city of Liège** is interesting due to its dense urban context strongly linked to the local topography and hydrography involving a complex land use (modern and old urban settlement and industrial zones, wasteland...).
- **Natura 2000 areas** have been proposed to test the capabilities for **forest change monitoring and forest managing**.
- The **surroundings of Liège** also include a station of the WALCORS (WALLonia Continuous Operating System) of **permanent GPS reference network** (in Sart-Tilman) that could be integrated into the reflection on the location of the CR's.
- A reference **crop forecasting** application will be developed for a 'limited' agricultural region in **Senegal**, i.e. +/- 1.000 ha in the Department of Nioro du Rip for rainfed crops (Millet and Peanuts) and in the Department of Dagana for irrigated crops (Rice). The study area has been identified based on former projects experiences (AGRICAB and Africa Rice) and local contacts of Spacebel and EED in Senegal (amongst whom the 'Centre de Suivi Ecologique').

EO Regions! – EO_Regions_Science coordination

(1)

EO_Regions_Science Project		Team	2016						2017						2018											
WP	Description		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3	4	5	6	7	8	9	0	1	2
0	Management	CSL																								
1	Corner Reflectors	CSL																								
2	Ontologies	UGEOM																								
3	Change Detection	RMA																								
4	In-situ data	ISSeP																								
5	AquaCrop	EED																								
6	Dissemination	All																								

EO_Regions! Project		Team	2016						2017						2018											
WP	Description		1	2	3	4	5	6	7	8	9	0	1	2	1	2	3	4	5	6	7	8	9	0	1	2
0	WP0 - Gestion du projet																									
1	WP1 - Infrastructure																									
	T1.1 - Analyse des besoins en services et en données																									
	T1.2 - Design et mise en place de l'infrastructure																									
	T1.3 - Adaptation et déploiement des services																									
	T1.4 - Validation des services																									
2	WP2 - Technologies SAR et données SENTINEL 1																									
	T2.1 - Utilisation des coins réflecteurs pour SENTINEL1	CSL																								
	T2.2 - Développement de l'interférométrie SAR différentielle pour SENTINEL 1	CSL																								
	T2.3 - Structuration et gestion des entrepôts des données raster et vectorielles																									
3	WP3 - Certification des couvertures régionales																									
	T3.1 - Développement des technologies innovantes d'analyse RADAR	RMA-CSL																								
	T3.2 - Développement d'ontologies	UGEOM																								

EO Regions! – EO_Regions_Science coordination

(2)

EO_Regions_Science Project		Team	2016					2017					2018										
WP	Description		1	2	3	4	5	6	7	8	9	0	1	1	1	1	2	1	1	1	1	0	1
0	Management	CSL																					
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EO_Regions! Project		Involved team	2016						2017						2018											
WP	Description		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	T3.3 - Définition des règles incohérence thématiques, spatiales et temporelles d'exploitation des données	UGEOM																								
	T3.4 - Validation de la propagation de précision et du suivi de la cohérence du croisement de données	UGEOM																								
	T3.5 - Directives de certification des couvertures	UGEOM																								
	T3.6 - Design et création d'une bibliothèque d'archives SENTINEL 1 et 2																									
4	WP4 - Accessibilité																									
	T4.1 - Développement d'un moteur de recherche dans les métadonnées d'usages destinés aux thématiciens non experts.																									
5	WP5 - Ontologies																									
	T5.1 - Recherche des règles et contraintes d'interopérabilité et de diffusion Open Data	UGEOM																								
	T5.2 - Mise en place du service d'accès et de diffusion de données	UGEOM																								
6	WP6 - Chaînes de valeurs pour les régions européennes et les pays émergents																									
	T6.1 - Opération et évaluation de la vitrine technologique pour les pays émergents																									
	T6.2 - Opération et évaluation de la vitrine technologique pour la région wallonne																									
	T6.3 - Etude des possibilités d'exploitation de la vitrine technologique en Région Wallonne dès la fin du projet																									
	T6.4 - Dissémination																									