Third Space for Hydrology Workshop

Surface Water Storage and Runoff: Modeling, In-Situ data and Remote Sensing

15-17 September 2015

ESA-ESRIN, Frascati (Rome), Italy

Version 9 - 11 September 2015   ID

			Day 1, Tuesday 15 September 2015		
08:15	09:00	45	Registration		
09:00			**Opening Session**	Chairs: Jérôme Benveniste, Jean-François Crétaux	
09:00	09:15	15	Welcome	D-EOP, H/EOP-S or Jérôme Benveniste European Space Agency	
09:15	09:30	15	Workshop Objectives	J.-F. Crétaux, Selma Cherchali and J. Benveniste CNES, CNES and ESA	
09:30	09:50	20	The Surface Water Ocean Topography Mission (1): Capabilities for Hydrology	Philip Callahan, Ernesto Rodriguez, Daniel Esteban-Fernandez, Parag Vaze	75
09:50	10:10	20	New Characterization of SAR Mode Altimetry Data over Inland Waters	Nicolas Bercher and Pierre Fabry	84
10:10	10:40	30	Coffee break		
10:40			**Session 1: Space Techniques**	Chairs: Philippa Berry, Nicolas Bercher	
10:40	11:00	20	The potential study of the spatial and temporal hydrological variability of French rivers and estuaries from the SWOT satellite	Benoit Laignel, Laetitia Chevalier, Imen Turki, Florent Lyard	33
11:00	11:20	20	Inland water analysis of Crysosat2 FBR data within CRUCIAL	Philip Moore, Philippa Berry, Stephen Birkinshaw, Robert Balmbra, Salvatore Dinardo, J. Benveniste	64
11:20	11:40	20	The potential of CryoSat-2 SAR mode data for lake level estimation	Karina Nielsen, Lars Stenseng, Ole Andersen, Heidi Villadsen, Per Knudsen	63
11:40	12:00	20	Exploitation of the delay/Doppler altimeter high performances over inland water domain	Pierre Thibaut, Thomas Moreau, Franck Mercier, Jérémie Aublanc	57
12:00	12:20	20	From Cryosat-2 to Sentinel-3 – Retrieval of River System Heights	Philippa A.M. Berry, Mark Salloway, Robert Balmbra, Richard Smith, Jérôme Benveniste	47
12:20	12:40	20	*Discussion*		
12:40	14:00	80	Lunch		
14:00			**Session 2: Space Techniques (cnt'd)**	Chairs: Ole Andersen, Philip Callahan	
14:00	14:20	20	Spatial resolution and error estimate of GRACE temporal gravity field models	Sean Bruinsma, Jean-Michel Lemoine, Paoline Prevost	28
14:20	14:40	20	Water storage variations at different temporal scales derived from GRACE data by wavelet-based multi-resolution representation (MRR) and principal component analysis (PCA)	Gerhard Ressler, Michael Schmidt, Florian Seitz, C. K. Shum, Kun Shang	22
14:40	15:00	20	Water bodies mapping with SWOT: what can we learn from GPM mission and the legacy of SAR imagery?	Romain Husson, Nicolas Longepe, François Soulat, Alexis Mouche, Guillaume Hajduch, Pierre Dubois	45
15:00	15:20	20	Generation and use of SAR Images derived Water Masks in Altimetry and Hydrology	Pierre Fabry and Nicolas Bercher	82
15:20	15:40	20	*Discussion*		
15:40	16:10	30	Coffee break		
16:10			**Session 3: Space Techniques (cnt'd) - 15**	Chairs: Mohammed Tourian , Augusto Getirana	
16:10	16:30	20	Surface Water Derivation with WaMaPro to support hydrological Applications	Juliane Huth, Claudia Kuenzer	74
16:30	16:50	20	Multi-satellite-derived surface and sub-surface water storage variations at river basin to global scales	Fabrice Papa, F. Frappart, C. Prigent, F. Aires, A. Guntner, A. Getirana, V. Vuruputur	76
16:50	17:10	20	Innovative Retracking Strategies for Complex Radar Echoes Over Continental Water Bodies	Franck Mercier, Adalbert Arsen, Pierre Thibaut, Jean-Christophe Poisson, Fanny Piras	77
17:10	17:30	20	*Discussion*		
17:30	18:30	60	**Poster Session**		
18:30	19:30	60	Ice Breaker Reception		

			Day 2, Wednesday 16 September 2015		
08:30			**Session 4: Space Techniques (cont'd) - 16**	Chairs: Angelica Tarpanelli , Jérôme Benveniste	
08:30	08:50	20	Synergy of in situ and multi-mission satellite altimetry: dealing with systematic biases and river slope estimations	Nicolas Bercher, Pierre Fabry	83
08:50	09:10	20	Towards global river bathymetry estimate at 15m resolution using fusion of free remote sensing datasets, Google Earth Engine and geomorphological assumptions	Gennadii Donchyts, H. Winsemius, J. Schellekens, N. van de Giesen, Y. Huismans, D. Yamazaki	87
09:10	09:30	20	A Kalman Filter approach to estimate river discharge using multi-mission altimetric water level time series	Mohammad J. Tourian, Nico Sneeuw	44
09:30	09:50	20	Using satellite rainfall (TRMM) to estimate inundation flowpaths	Pedro Paredes-Victoria, Miguel Rico-Ramirez	53
09:50	10:10	20	*Discussion*		
10:10	10:40	30	Coffee Break		
10:40			**Session 5: Monitoring Spatio-temporal Changes from Space: Applications to Water Resources Management**	Chairs: Jean-François Crétaux	
10:40	11:00	20	Thematic Exploitation Platform for Hydrology	Bernat Martinez, Benjamin Koetz, Peggy Fischer, Laura Moreno	49
11:00	11:20	20	Flood extent mapping service in the Hydrology Thematic Exploitation Platform	Fifame Koudogbo, Pablo Blanco, Laia Romero	81
11:20	11:40	20	Hydraulic model calibration by using satellite altimetry: comparison of different products	Alessio Domeneghetti, A. Tarpanelli, M. Tourian, L. Brocca, T. Moramarco, A. Castellarin, N. Sneeuw	52
11:40	12:00	20	Operational Use of Satellites for Managing African Water Basins - A case of Small Reservoirs in the Volta basin	Frank Annor, Ali Abbasi, Dirk Eilander, Nick van de Giesen	80
12:00	12:20	20	How much does each part of a watershed contribute annually to hydropower production?	Carlos Ribeiro, D. Mounts, S. Menezes, A. Santos, A. Lorenzon, D. Oliveira Filho	26
12:20	12:40	20	*Discussion*		
12:40	14:00	80	Lunch		
14:00			**Session 6: Modelling and Assimilation**	Chairs: Julius Wellens-Mensah	
14:00	14:20	20	Stem Drag Coefficient Calculation Using Uniform and Non-Uniform Assumption of Flow	cansu özyaman, cahit yerdelen, ali mahdavi mazdeh	96
14:20	14:40	20	Evaluation of explicit solution scheme of the two-dimensional overland flow model	Muthiah Perumal, Ravi Shakya	78
14:40	15:00	20	Estimation of river discharge from in-situ and remote sensing data, using variational data assimilation and a full saint-venant hydraulic model	Hind Oubanas, Igor Gejadze, Pierre-Olivier Malaterre, Franck Mercier	25
15:00	15:20	20	Potential value of satellite-based stream level observations to calibrate hydrological models	Jan Seibert	29
15:20	15:40	20	*Discussion*		
15:40	16:10	30	Coffee break		
			Session 7: Modelling and Assimilation (cnt'd)	Chairs: Vincent Haefliger	
16:10	16:30	20	Combining Envisat type and CryoSat-2 altimetry to inform hydrodynamic models	Raphael Schneider, P. Nygaard Godiksen, M.-E. Ridler, H. Villadsen, H. Madsen, P. Bauer-Gottwein	24
16:30	16:50	20	Assimilation of virtual SWOT river water elevations in a regional hydrometeorological model	Vincent Häfliger	42
16:50	17:10	20	River discharge assessment at ungauged river sites by using water level time series derived by altimetry products: the case study of the Danube River	Angelica Tarpanelli, Luca Brocca, Silvia Barbetta, Tommaso Moramarco	48
17:10	17:30	20	*Discussion*		
17:30	18:30	60	**Poster Session (continued)**		
19:45			Dinner (no host)		

			Day 3, Thursday 17 September 2015		
08:30			**Session 8: Modelling and Assimilation (cnt'd)**	Chairs: Selma Cherchali	
08:30	08:50	20	EarthLab Water Services	Sylvain Capo, Christelle Barbey	73
08:50	09:10	20	River discharge estimation using effective River width: A comparison between Landsat and MODIS images	Omid Elmi, Mohammad J. Tourian, Nico Sneeuw	86
09:10	09:30	20	Actual evapotranspiration estimation from rainfall-runoff budget and satellite observation (SEBS and LSA SAF) application to the Medjerda basin Tunisia	Zoubeida Bargaoui, Nesrine Abid, Chris M. Mannaerts	88
09:30	09:50	20	Introduction of a modified soil heat flux approach and its potential for improving remote sensing based surface energy balance	Patrick Knöfel	32
09:50	10:10	20	*Discussion*		
10:10	10:40	30	Coffee Break		
10:40			**Session 9: Modelling and Assimilation (cnt'd)**	Chairs: Selma Cherchali	
10:40	11:00	20	2D hydrodynamics of Pearl River Estuary using D-Flow Flexible Mesh	LI LI, Qinghua Ye, Jürgen Böhner	68
11:00	11:20	20	Water storage monitoring in the Yangtze River's connecting lakes based on 15 years of DRAGON EO imagery, altimetry time series and field measurements	Yesou Herve, et al.	89
11:20	11:40	20	Passu Glacial Lake Outburst Flood (GLOF) Mapping	Arjumand Zaidi, Muhammad Siddiqui	35
11:40	12:00	20	Improving flood predictions via sequential assimilation of SAR-derived inundation extent maps	Renaud Hostache, Laura Giustarini, Patrick Matgen, Marco Chini, Melissa Wood, Giovanni Corato	91
12:00	12:20	20	Toward the use of the SWOT data to improve hydrological global-scale modeling	Charlotte Emery, S. Biancamaria, A. Boone, S. Ricci, P.-A. Garambois, B. Decharme	41
12:20	12:40	20	*Discussion*		
12:40	14:00	80	Lunch		
14:00			**Session Summaries from Chairs, Discussion and Closing Remarks**	Chairs: Jérôme Benveniste, Jean-François Crétaux	
14:00	14:15	15	Space Techniques	Chairs	
14:15	14:30	15	Monitoring Spatio-temporal changes from space	Chairs	
14:30	14:45	15	Modelling and Assimilation	Chairs	
14:45	15:15	30	Round Table Discussion	Stephan Bojinski, Christophe Cudennec, Selma Cherchali & Christophe Brachet	
15:15	15:45	30	Plenary discussion and recommendations	All	
15:45	16:00	15	Closing discussion and wrap-up	Jérôme Benveniste and Jean-François Crétaux	
16:00	16:00	0	End of Workshop		

	Poster Sessions - Scheduled on day 1 Tuesday 15 September 17:30-18:30, day 2 Wednesday 16 September 17:30-18:30		
	Title	author	
	Session P1: Space Techniques	Chairs: N Bercher, O Andersen, P Callahan, M Tourian	
1	EGSIEM - a new Horizon2020 project to improve accessibility to gravity field products for hydrology	Sean Bruinsma et al.	27
2	Groundwater Changes In The Amazon Basin From Multi-Satellite Observations And Hydrological Models	Frédéric Frappart, F. Papa, J. Tomasella, G. Ramillien, A. Guentner, T. Emilio, J. Schietti, J. Carvalho, L. Se...	79
3	HYSOPE : an operational processing center for lakes and rivers observation	Philippe Pacholczyk, Jean-Francois Cretaux, Marie-Claude Gennero, Stephane Calmant	94
4	ArcGIS software for Flood risk management in response on Climate Change in Georgia	Kakha Nadiradze	16
5	Effects of land use land cover changes on stream flow	Dawd Temam	17
6	Climate Change Impact on Variability of Rainfall Intensity in Upper Blue Nile Basin	Lakemariam Yohannes Worku	20
7	MAPS: the Multi-mission Altimetry Processing Software	Frédéric Frappart, Vincent Marieu, Stéphane Calmant, Frédérique Seyler	59
8	Surface Soil Moisture from SRAL Satellite Radar Altimetry	Philippa A.M. Berry, Robert Balmbra	71
9	Inland Water Masking and its role in successful inland water height retrieval	Richard Smith, Philippa Berry, Mark Salloway	54
10	Determining cross sections of small water courses using LiDAR point data	Jennifer Roelens, Jos Van Orshoven, Jan Diels, Stefaan Dondeyne, Seppe Deckers	43
11	Water surface and volume monitoring with the future SWOT mission: Generation and use of DEM	laurence fruteau	58

Operational Use of Satellites for Managing African Water Basins - A Case of Small Reservoirs in the Volta Basin

While the impact of climate change is exacerbating issues of pollution, land degradation, poor ecosystem services, and unsustainable use of water resources across the Africa Continent, the need for more water infrastructure is becoming more eminent. Lack of water infrastructure investment coupled with slow uptake of No/Low regret investment projects is gradually inhibiting the continent's economic development. This situation calls for a better planning of new water infrastructure and an efficient management of existing ones. This is easier said than done especially where most reservoirs are not (properly) gauged. The small reservoirs project (www.smallreservoirs.org) has shown over the past decade that it is possible to monitor the surface extent of water bodies from space (using satellite imagery) and to combine this with the areas covered by the water and their volumes using a field correlation developed from bathymetric surveys (Annor et al., 2009, Liebe et al., 2005). The area alone explained over 98% of the variance in the Area-Volume correlation giving a strong indication that monitoring stored water in reservoirs by just their surface areas from space was doable and quite accurate. Long time series of both optical (landsat, spot, rapideye, quickbird) and radar (ASAR, ESR-1/2, Radarsat-2) images have been used for these analyses with all showing very promising results. Recently it has been shown that a combination of both optical and radar satellite images yield optimal results especially with clouds affecting optical images in the rainy season, and radar images sometimes requiring more polarizations modes to reduce the effect of Bragg scattering. This algorithm was developed using a Bayesian classification system (Eilander et al., 2014) which creates more room for seamless integration of in-situ data and satellite data for improved classification of water bodies for flood mapping, runoff estimation and water balance assessment. The surface area-volume correlation was first developed in 2002 and re-evaluated after 10 years. It turned out that the correlation has not been affected much by sedimentation at least for the Volta basin. This cannot be said to be true for all basins, which points to the continued need for a dedicated effort of using in situ data combined with new observation systems, such as the Sentinels, to develop and update these correlations. We show in this research that the sentinels are a great addition to the satellite constellations available for near-real-time water monitoring combined with cost-effective TAHMO ground stations for operational water management in the Volta basin to support decision making in agriculture to alleviate poverty.