isprs SPECTRUM
ISPRS STUDENT CONSORTIUM
The Official Newsletter of the ISPRS Student Consortium

APPLICATIONS OF REMOTE SENSING AND GEOSPATIAL INFORMATION TO CLIMATE CHANGE

SATELLITE RS FROM **THE ARCTIC TO ANTARTICA**

ARCTIC OCEAN SEA LEVEL RECORD FROM THE COMPLETE RADAR ALTIMETRY ERA

RS SENSORS SUPPORTING FIRE MANAGEMENT; AUSTRALIA, WE CAN DO BETTER

IFOV: **DR. JOSEFINO COMISO**

VOLUME NO. 13, ISSUE NO. 4
FEBRUARY 2020

TABLE of CONTENTS

4 | BACKSIGHT

- SERFA 2019: Remote Sensing Applications for Defense and the 5th ISPRS Student Consortium Summer School and IEEE GRSS Young Professionals
- Report on the Asian Conference on Remote Sensing (ACRS 2019) Student Activities and ISPRS SC Summer School

11 | SPOTLIGHTS

- Can Young People Move Beyond #FridaysForFuture?
- Satellite Remote Sensing from the Arctic to Antarctica
- Remote sensing sensors supporting fire management; Australia, we can do better
- Arctic Ocean Sea Level Record from the Complete Radar Altimetry Era

15 | IFOV

- Dr. Josefino Comiso

18 | FORESIGHT

- GEO-6 for Youth
- ISPRS Congress 2020

20 | OPPORTUNITIES

22 | IN THE HORIZON

ENGAGE *WITH OUR GLOBAL NETWORK OF EXPERTS AND* **BE EMPOWERED**

Follow us on:
groups/isprssc
@ISPRS_SC
@ISPRSSC

JOIN the SPECTRUM TEAM!

We are constantly in search for passionate volunteers to be part of the ISPRS-SC Newsletter team. If you are a student or a young professional (ages 20–35 years old), willing to lend your time and skills with the passion to tell stories, share knowledge and experiences, then join us as a CONTRIBUTOR to the Spectrum.

Have a passion for design, layouts and infographic?
Be one of the volunteers of our CREATIVE DESIGN TEAM
and help us tell stories through pictures and images.

Take the opportunity to work with an international array of experts to bring the latest stories and developments in the field of Remote Sensing, Geomatics and Photogrammetry.

Click here to register as a Volunteer TODAY!
https://goo.gl/QcsABN

Or you can email us at **sc@isprs.org**

NEWSLETTER

SC Newsletter (ISSN 7506-5879) is published by *ISPRS Student Consortium*.

To join our members area, visit **sc.isprs.org**.

Dear ISPRS SC Newsletter readers,

I am so happy and proud that I have the opportunity to say the introductory words in the first issue of this year's newsletter. First of all, I would like to wish you all a happy and successful new year!

For all of us, the last news and images taken during the fires in Australia where many defenseless animals died, were very terrible. Experts have argued that the forest fires of the 2019-2020 years were the most destructive in the entire history of observations. According to the results of climate research, it is proved that climate change leads to an increase in the number of catastrophic natural phenomena, including the forest fires in Australia and Arctic ice melting. Therefore, the implementation of modern technology for research on the primary causes of environmental accidents is important. In this issue of the newsletter, our team examined one of the most important environmental issues, namely the topic of climate change. We studied and interviewed specialists who research climate changes that have occurred in different parts of our planet using especially Earth Observation data. I would like to introduce you to our contributors: Dr. Ozsoy is the Director of TUBITAK PRI participating in Antarctic expeditions, Dr. Stine is a Post-Doctoral Researcher at the Technical University of Denmark currently involved with satellite altimetry projects observing the climate change in the Arctic and Antarctic Oceans, Dr. Marta Yebra is a Senior Lecturer in Environment and Engineering at the Australian National University, and she wrote an article about the bushfires in Australia, and Dr. Comiso, who is featured in our IFOV section, is a scientist at NASA as well as the lead author of the cryosphere observations.

Also in this issue, you can find out interesting events organized by the ISPRS. It is a must note that, this year, we are waiting for an amazing event of the ISPRS which will bring together researchers from different parts of the world in the field of Earth Observation from space. You can find more information about this event, and grants from ISPRS, in the Foresight section. Also, don't forget to check out the section about career opportunities including job openings, PhD and Master's degrees, fellowships and scholarships for students, yo g professionals and all of you. I wish good luck to everyone!

I would also like to avail myself of the opportunity to express my gratitude to the ISPRS and in particular to ISPRS SC team. I gained real motivation to continue my research and didn't back down thanks to the fact that last year I became a board member and find like-minded friends. Thank you so much for believing in me and motivating not only me but also the students who are studying remote sensing in my country. I would like to remind everyone to never give up and don't stop believing in yourself, continue to dream and work hard because dreams come true!

On behalf of all the board members of the ISPRS SC, I appreciate all the contributors who accepted our proposal and invitation in submitting articles for this issue. Thanks to all who participated in the development of this issue! Finally, I conclude by hoping that you find this issue of the newsletter very interesting. Enjoy reading!

SONA GULIYEVA
Web Administrator
ISPRS Student Consortium

CAN YOUNG PEOPLE MOVE BEYOND #FRIDAYSFORFUTURE?

From Stockholm to the Solomon Islands, millions of young people have taken to the streets ringing alarm bells about the climate change crisis and participating in global campaigns like 'Fridays for Future'. While the protests showcase the youth's frustration in current socio-political systems of managing the climate emergency, they are increasingly bringing young people into the limelight of 'taking action' and several governmental and non-governmental actors are now reinforcing this rhetoric for holistic sustainable development.

Sustainable development has put a strong emphasis on grass-roots and civil society engagement, as showcased in SDG 17 on partnerships and collaborations, and endorsement of voluntary public-private agreements between state and non-state actors. The problem with existing global environmental and climate governance approaches has been the traditional state-centered vision of policy change and implementation. For instance, the 1987 Brundtland report includes an appendix setting out 23 core principles for environmental protection and sustainable development. After an initial principle defining the individual's right to a sound environment, the remaining twenty-two principles each begin with the words 'states shall…'. The problem with the notion that 'states shall' is that states typically can't, even if they would, which they often won't. Frequently, the state lacks the uncontested authority to control local access to and use of environmental resources. Besides stakeholder participation becoming prominent in Agenda 21 of the Earth Summit in 1992, most governments still struggle with shifting from a 'command and control' approach to the vertical and horizontal inclusion of civil society in environmental and climate governance.

Rajendra Pachari, Chairman of the IPCC at COP15 said, "It is the youth of the world who can set the agenda for the future and pursue it with diligence. We must do all we can to empower young people to take action, because the future belongs to them." The Global Humanitarian Forum notes that "we are not going far in addressing climate change when we do not give pivotal importance to the social dimension it implies. And those dimensions directly linked to maintaining the good livelihood of forth-coming generations makes it imperative to actively involve the youth from the start. Their own future and the perspectives for their children are at stake!"

But is the global climate governance landscape open to young people? Besides the streets, how difficult is it for young people to claim actual spaces of decision-making and action? It is imperative to look at climate governance structures and frameworks through the youth engagement lens to ascertain the enablers and deterrents for effectively engaging young volunteers – not as targeted beneficiaries but also as collaborators and leaders initiating positive climate action at multiple geographical levels.

Besides the challenges, there is a global surge in the number of youth-led climate action initiatives and these are expected to increase further – especially in Africa and Asia-Pacific regions. This increase can be attributed to a global and regional recognition of the youth in the decision-making processes for sustainable development, growing focus on youth-led social innovation, and the emergence of conducive policies and support systems at the international, regional and national levels.

> *Rajendra Pachari, Chairman of the IPCC at COP15 said, 'It is the youth of the world who can set the agenda for the future and pursue it with diligence. We must do all we can to empower young people to take action, because the future belongs to them.'*

However, youth leadership within and beyond the climate action sector is not problem free: tokenistic engagement, marginalization of vulnerable youth groups, inter-generational mistrust, and adult-centric decision and organizational structures create additional challenges for youth involvement. There is a growing need to critically assess the assumed 'unequivocal' relationship between young people and the opening of spaces for 'real' climate action. This can help key stakeholders, including regional and national governments, IGOs, CSOs/ NGOs, academia and private partners, in gaining an insight into the governance context, policy frameworks, and engagement practices to help strengthen youth-led climate governance across the regions and help young people move beyond #FridaysforFuture.

Mohsen is a policy entrepreneur whose doctoral research work at the Universities of Nottingham and Oxford focused on critically analyzing how youth volunteering can be mainstreamed in multi-level environmental governance processes in Pakistan. He has co-founded 'Green Box', Pakistan's first youth-driven engagement lab nurturing sustainability leadership in Pakistan.

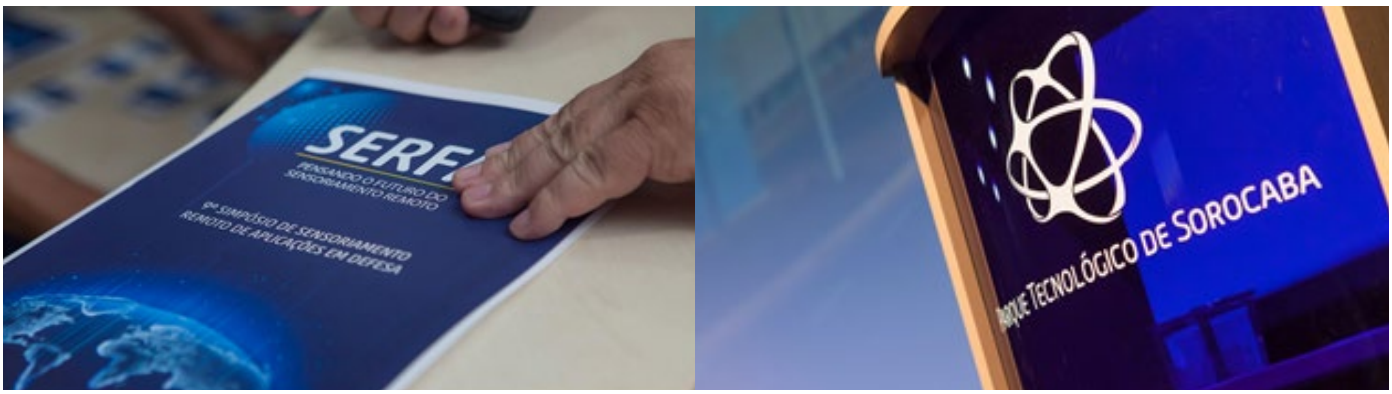
He has over 8 years of diverse experience in the international development sector and has undertaken several research and advocacy assignments with UNESCO, UNDP and UN Volunteers in the UK, Thailand, Kenya, Brazil and Nepal. Mohsen was selected as UN Young Champion of the Earth (Asia and the Pacific) regional finalist 2019 and won Emerging Star for Policy Impact award 2019 at the University of Nottingham.

MOHSEN GUL
mohsen.gul@nottingham.ac.uk

Doctoral Researcher
University of Nottingham: UK

SERFA 2019: REMOTE SENSING APPLICATIONS FOR DEFENSE AND THE 5TH ISPRS STUDENT CONSORTIUM SUMMER SCHOOL & IEEE GRSS YOUNG PROFESSIONALS

Sheryl Rose Reyes and Dr. Veraldo Liesenberg



The Remote Sensing in Defense Applications (Portuguese: Simpósio de Sensoriamento Remoto de Aplicações em Defesa, SERFA) (Fig. 1a) was organized by the Institute for Advanced Studies (IEAv) from November 10 – 14, 2019 in the city of Sorocaba, Sao Paulo State, Brazil with the theme "Space Technology, Markets and Building the New Brazilian Space Age." This was the ninth edition of the event that started in 1996 and, for the first time, occurred outside of Sao Jose dos Campos city, where it had always taken place. The SERFA symposium was hosted at the Sorocaba Technological Park (Fig. 1b) from November 10 to 14, 2019. Both local and international participants attended the event.

The fifth edition of the ISPRS Student Consortium (ISPRS SC) Summer School (SS) and IEEE sciences and Remote Sensing Society - Young Professionals (IEEE-GRSS YP) led by members of the GRSS' Brazil Chapter (https://r9.ieee.org/brazil-grss/) was hosted for the first time within the SERFA Symposium. Members of the organizing committee from IEAv have been active members of the GRSS' Brazil Chapter, which resulted in a successful joint event and the proposal of additional activities.

The Summer School was divided into the basic and advanced modules on Synthetic Aperture Radar (SAR). The first module focused on the fundamentals and concepts of SAR and was led by both Dr. Rafael Rosa (Visiona Space Technology) and Dr. João Alberto Moreira (Bradar, Embraer Defense & Security). The lectures included discussions based on SAR geometry and data acquisition, existing sensors, and missions, payloads, and data processing techniques, including polarimetric interferometry. Several examples and images were used to show the attendants the benefits and possible applications of SAR data. Sixty participants from different backgrounds and different regions of the country attended this module.

The second module concentrated on the advanced topics and applications of SAR remote sensing. Dr. Timo Balz from Wuhan University (China) started the lectures with a comprehensive review of the fundamental concepts of Interferometry, Differential Interferometry, and Persistent Scatterer Interferometry. Dr. Alejandro Frery of the Federal University of Alagoas (Brazil) introduced the statistical information theory and geometry for analyzing and processing SAR images. Dr. Andrea Buono from the

University of Naples “Parthenope” (Italy) explained the current trends on ocean SAR polarimetry and future applications and perspectives for research. A total of forty participants attended the second module.

Succeeding lectures were held during the symposium proper. These included Dr. Veraldo Liesenberg’s (Fig.3a) lecture on “Forest Remote Sensing” (Santa Catarina State University, Brazil) and Dr. Andrea Buono’s “SAR Polarimetric Data Physical Processing to Generate Value-Added Products.” Dr.

Timo Balz presented another application of radar imagery in the lecture on “Surface Motion Estimation of Synthetic Aperture Radar (SAR).” An important topic delivered by Dr. Alejandro Frery was on scientific publication and “Repeatability and Reproducibility.” Ms. Sheryl Rose Reyes (Fig.3b), Chair of the ISPRS SC, presented the “Importance of International Organizations: Lessons Learned from ISPRS and the

ISPRS Student Consortium,” which included an introduction of ISPRS and ISPRS SC as well as the organizations’ activities and contributions in the fields of remote sensing, photogrammetry, and spatial information science. Keynote presentations in the symposium included the current research and trends in science, technology, and innovation for Brazil delivered by Dr. Darcton Policarpo Damião (Fig.4a), current Director of the Brazilian National Institute for Space Research (INPE). Additionally, a lecture from Jon “Maddog” Hall (Fig.4b), Board Chair of the Linux Professional Institute, focused on the topic “Internet of Things” and, more specifically, on “Security, Privacy and Longevity”. The symposium showcased the current work by the Institute of Advanced Studies (IEAv) and research and development from various organizations and academia. The industry and business sectors also presented state-of-the-art technology for data and image acquisition, image processing and analysis, and optimization algorithms. A total of forty-five speeches and talks were presented. The webpage of the event containing the program of activities is available at www.serfa.com.br.

(Photos taken from the official SERFA photo gallery and courtesy of Dr. Veraldo Liesenberg and Ms. Sheryl Rose Reyes)

The event also hosted a Pitch Battle and Hackathon titled "The Amazon 4.0 Challenge." These events (Fig. 5) were challenges to think beyond the current trends in technology and focus on creating a "Smart Forest" – protecting, monitoring, and defending the world's biggest tropical rainforest and its biodiversity. Participants in these events included both students and start-up companies offering innovative and creative solutions.

Round table discussions featured leadership initiatives in science and technology and advances in the agribusiness sector. These discussions provided a more dynamic interaction with the speakers and welcomed questions from the audience and moderator to give insights to issues and potential solutions for this vital sector in Brazil. The symposium was a great success, enabling the gathering of three important stakeholders in research and development – the government, academia, and the industry. The event was an incredible opportunity to learn more about the current trends and status of remote sensing as applied to the various issues and innovations in Brazil. It was also a big event for many of the students who attended the summer school because it provided additional opportunities to engage through the Hackathon and the Pitch Battle. SERFA will be hosted in other cities in Brazil in the coming years and will continue to share the development, applications, and advancements of remote sensing in the country.

REPORT ON THE ASIAN CONFERENCE ON REMOTE SENSING (ACRS 2019) STUDENT ACTIVITIES AND ISPRS SC SUMMER SCHOOL

Sheryl Rose Reyes

THE STUDENT ACTIVITIES IN ACRS 2019

The 40th Asian Conference on Remote Sensing (ACRS 2019) was held from October 14 – 18 at the Daejeon Convention Center, Daejeon, South Korea. This year's conference, which was organized in partnership with the Korean Society on Remote Sensing and the Daejeon Metropolitan Government, was themed "Progress of Remote Sensing for a Smart Future." Student activities such as WEBCON9, Student Session, and Student Night were again organized this year.

Six entries were received for WEBCON 9, with participants coming from Taiwan, Japan and South Korea. The judges were Dr. Paolo Gamba from IEEE GRSS, Dr. Anjana Vyas from CEPT University, Dr. Kohei Cho from the Asian Association on Remote Sensing (AARS), and Dr. Fuan Tsai from National Central University. The Bronze prizes were awarded to Ms. Regita Pramesti Nur Cahyani of National Central University in Taiwan for her entry titled "A Personalized Geowebsearch Engine Based on User Intent Recognition" and to Mr. Kouki Kurita, Mr. Yuichiro Yamaguchi and Mr. Riku Nozaki of Shibaura Institute of Technology for the entry "Workout GIS." Mr. Takuho Matsuo of Tokai University, Japan received the Silver prize with his entry titled "Situation Visualization System of Disaster Area Using Track Mounted Camera." The Gold Prize was given to Mr. Tzu Cheng Hou and Ms. Yu Qi Lin of National Taiwan Normal University for their work on "Virtual Indigenous Tribe Immersive Virtual Reality." Certificates of appreciation were given to the other entries who presented their masterpiece in this special session.

The Student Session chaired by Ms. Sheryl Rose Reyes, Chair of the ISPRS Student Consortium (ISPRS SC) and co-chaired by Mr. Seung Joo Yoon of Inha University followed the White Elephant Session in the afternoon. Ten presentations were delivered during the session, including the presentation of the ISPRS Student Consortium and the student activities in ACRS given by Sheryl Rose Reyes. The universities that presented were the University of the Philippines (Department of Geodetic Engineering and Institute of Environmental Science and Meteorology), the University of Tokyo, the Shibaura Institute of Technology, National Central University, National Taiwan Normal University, Tongji University, Inha University, and the Ulsan National Institute of Science and Technology. The WEBCON winners were also announced at the end of the Student Session. Finally, the Student Night was held in the evening to gather students and young professionals to socialize and establish their professional networks. About 70 students attended the student night and, with the assistance of the students from Inha University's IE Lab, icebreakers and games were hosted. Mr. Miguel Luis Lagahit from National Cheng Kung University was the event's emcee. The participants also enjoyed great food and drinks.

Every year, the student activities in ACRS continue to attract more and more participants. Professors, students and young professionals are now familiar with these events, which provide more opportunities for AARS to engage the youth.

THE ISPRS SC SUMMER SCHOOL

The ISPRS SC Summer School was held at the Korea University in Seoul, South Korea after ACRS2019 from October 21 – 25, 2019. The theme of the summer school was "New Remote Sensing Technology for Smart Future." It consisted of about 10 sessions, including lectures and hands-on sessions. A total of 28 participants from the Philippines, Indonesia, Malaysia, Japan and South Korea attended and completed the summer school.

The summer school was opened by Dr. Woo-Kyun Lee of Korea University and the Korean Society of Remote Sensing. The first lecture on drone mapping was given by Dr. Chul-uong Choi, followed by sessions in the afternoon on SAR and interferometry and machine learning on EO data for agricultural applications given by Dr. Ioannis Papoutsis and Dr. Vassilis Sitokonstantinou, respectively. The first day concluded with a Korean BBQ party where Professor Seongwoo Jeon taught the participants about Korean culture and how to enjoy food and drinks in Korea.

The second day sessions included one on climate change risk assessment using Earth observation data facilitated by Dr. Woo Kyun Lee, followed by a lecture on forest monitoring by Dr. Haemi Park. The last session was handled by Dr. Nguyen Dinh Duong, who discussed his work on automated classification of land cover with Landsat image data and demonstrated the capabilities of the program he created for the image classification.

Dr. Sang Wan Kim started the session on the third day with a lecture on SAR interferometry with a focus on InSAR and PS InSAR. Dr. Chulsoo Ye discussed his work on monitoring of flooded areas using multi-sensor satellite imagery. The last session, with Dr. Hoonyol Lee, focused on satellite and ground-based SAR systems and applications.

The fourth day was a field trip to the Korean Folk Village in Gyeonggi-do, which was about 2 hours away from Seoul. The participants were introduced to the historical folk villages of the country and enjoyed cultural music and dance performances. A candle-making session was held in the afternoon, providing participants an opportunity to make their own scented candles as their personal souvenirs.

Finally, the last session in the summer school, which focused on the quality assessment of high-resolution optical images, was given by Dr. Taejung Kim. A short campus tour followed and participants took great photos around the beautiful surroundings of Korea University. The closing ceremony was hosted by Dr. Woo-Kyun Lee, Dr. Seongwoo Jeon, and Ms. Sheryl Rose Reyes. Certificates were awarded to all the participants and everyone bid farewell to new friends, professors and to the local organizers of the summer school.

The summer school provided comprehensive lectures on automation, radar remote sensing, and image quality assessment as well as on the current applications of Earth observation data to climate change. These lectures are of great importance to students and young professionals alike, given that Earth observation data is becoming more important in achieving a smart and sustainable future. In addition, the lectures on radar remote sensing from the South Korean professors provided a comprehensive explanation of the basic concepts and extended to the applications of radar imagery. Overall, the summer school was a great success.

Photos taken by Dr. Nguyen Dinh Dong, Sheryl Rose Reyes, and Yoonji Kim

SATELLITE REMOTE SENSING FROM THE ARCTIC TO ANTARCTICA

Antarctica is the fifth largest continent. It is surrounded by the Southern Ocean and its sea ice zone remains the least known region of the Earth's surface. On the other hand, the Arctic is an ocean almost completely surrounded by land. Sea ice in the Arctic differs from that in the Antarctic because of their geographical differences. Arctic-formed sea ice is not as dynamic as sea ice in the Antarctic. Seasons are also opposite between the Southern and Northern Hemispheres; the South reaches its summer minimum in February, while the North reaches its summer minimum in September. Considering both poles, ice starts to grow during fall.

The role of sea ice in the global climate system has long been recognized and included as a study component of major international weather and climate programs such as the Intergovernmental Panel on Climate Change (IPCC), the Polar Sub-Program of the Global Atmospheric Research Program, and the World Climate Research Program. However, examining Arctic and Antarctic sea ice time-varying characteristics is quite difficult due to the vastness and remoteness of both regions.

Satellite-derived sea ice concentration data show the sea ice coverage for the Arctic and Antarctic. There are parameters can be driven from Remote Sensing Data other than sea ice concentration, such as sea ice extent, motion, types, and thickness. In this respect, remote sensing capabilities greatly enhance sea ice observation from space, especially sea ice monitoring using AMSR-E, AMSR2, ASCAT, ICESAT, QUIKSCAT, CryoSat-2, and Sentinel. However, while ice conditions can be ascertained from satellite-derived data, the validation of remote sensing data is still necessary.

Countries conduct sea ice zone-related physical and biological research within their National polar programs. A number of sophisticated, ice-strengthened research vessels are now working in the Polar Regions. Such vessels make the systematic collection of observational data on sea ice morphology and distribution possible. The data collected include ice concentration, ice type, ice thickness, floe size, topography, snow cover (snow type and thickness), and meteorological data, including sea temperature, air temperature, wind speed, direction, cloud cover and visibility. Additionally, other in-situ measurements can be conducted, such as ice coring, ice drilling and surveying to validate remote sensing data.

Polar Research Institute (PRI) Director
Scientific and Technological Research Council of Turkey (TUBITAK)

Dr. Burcu Ozsoy received MA degrees at the Department of Geodesy and Photogrammetry Engineering at Yıldız Technical University. In 2001, she started to teach at the Maritime Faculty in Istanbul Technical University. She started her doctoral study in 2005 at the University of Texas in San Antonio. Within the framework of her doctoral study, she participated in her first Antarctic Science Expedition in 2006 with American and Swedish scientists, during which she collected terrestrial/in-situ data on sea ice observations. She then worked on the verification of satellite images with in-situ data and also on sea ice interaction with climate change in Antarctica. She is the founding director of Polar Research Center (PolReC) established at Istanbul Technical University in January 2015. PolRec, Turkey's first and qualified polar research center, with its administrative staff, national and international scientific collaborations, undertook the task of a national roof. The center coordinated the Antarctic Scientific Expeditions under the auspices of the Presidency, as well as conducted the polar scientific program strategy.

DR. BURCU OZSOY
burcu.ozsoy@tubitak.gov.tr

REMOTE SENSING SENSORS SUPPORTING FIRE MANAGEMENT; AUSTRALIA, WE CAN DO BETTER

We are in the worst bushfire season in Australia. For more than three months, Australia has suffered from peaks of fire activity followed by favourable conditions where firefighters, supported by water-bombing aircrafts, have worked on strengthening containment lines to slow the spread of fire ahead of extreme fire danger forecast conditions.

More frequent and severe bushfires are expected in the coming years, and more people will be living in high-risk bushfire areas, so there will be more competition for firefighting resources. There have been calls for a national firefighting force to supplement existing state resources, but that is not a long-term solution.

The increasingly challenging fire management situation and growing direct economic costs call for proactive approaches to first reduce the likelihood of catastrophic bushfires and then provide a quick response.

Earth observation has a huge potential to help towards this approach and, indeed, it's already supporting fire management in Australia but not at the full potential as it heavily depends on data made available by other international space agencies.

For example, satellite data from the NASA-Moderate Resolution Imaging Spectroradiometer (MODIS) imaging sensor is contributing to the characterization of fuel moisture content (http://anuwald.science/afms). Fuel moisture content is one of the on-off switches for bushfires and data on this can be retrieved from satellite imagery given the effect that water has on the spectra reflectance through absorption of radiation within certain spectral regions. Despite spatially explicit maps telling fire managers how dry the fuel is and how likely it is that the fuel ignites and spreads (Figure 1), fuel condition currently monitored using MODIS data does not fully fit the purpose in terms of readiness, spatial resolution, and signal sensitivity in Eucalypt forests.

Middle and thermal infrared observations from the same MODIS sensor are used to detect active fires or hotspots (https://hotspots.dea.ga.gov.au/). However, satellites pass over a given area in Australia no more than 4 times a day and, consequently, some fires are missed. Similar information can be retrieved every 10 to 15 minutes from the Japanese Himawari-8 satellite making it possible to detect more active fires and to track in detail the evolution of the fire line and fire radiative power. However, the broader spatial resolution of the Himawari-8 satellite means that fires cannot be detected until they are of considerable size or intensity.

Finally, after the fire, optical satellite data mainly from the European Space Agency's Sentinel-2 and NASA/USGS's Landsat program are used to analyze fire severity and vegetation recovery (Figure 2 and 3). Analyzing fire severity right after the fire is of ultimate importance for targeting remediation efforts to protect, for example, water supplies post-fire, while vegetation recovery will dictate the amount of fuel available for the next fire season.

Despite all these examples of earth observation data being used to retrieve critical fire information on our current fire crisis, Australia can definitely do better by launching its own space mission targeted to meet fire management requirements

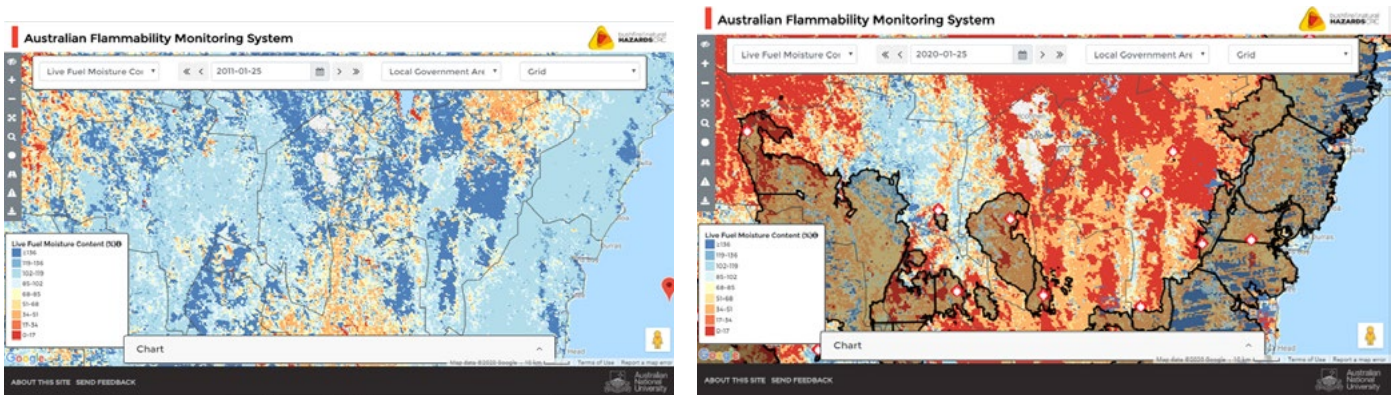


Figure 1. Maps showing areas burned and active incidents reports with the fuel moisture content maps as the background as per 25-01-2020 (right), and in 2011 (left) for comparison. Extremely dry conditions in 2020 provided the precondition for the fuel to easily ignite and the fire to spread uncontrollably. Source: http://anuwald.science/afms

in terms of temporal and spatial resolution and to better fit to Australian conditions. If we don't do this, we will miss opportunities to provide more accurate intelligence to firefighters given the fire seasons to come in a changing climate.

The following were developed using the methods described here: **bit.ly/ 38JSIIM**

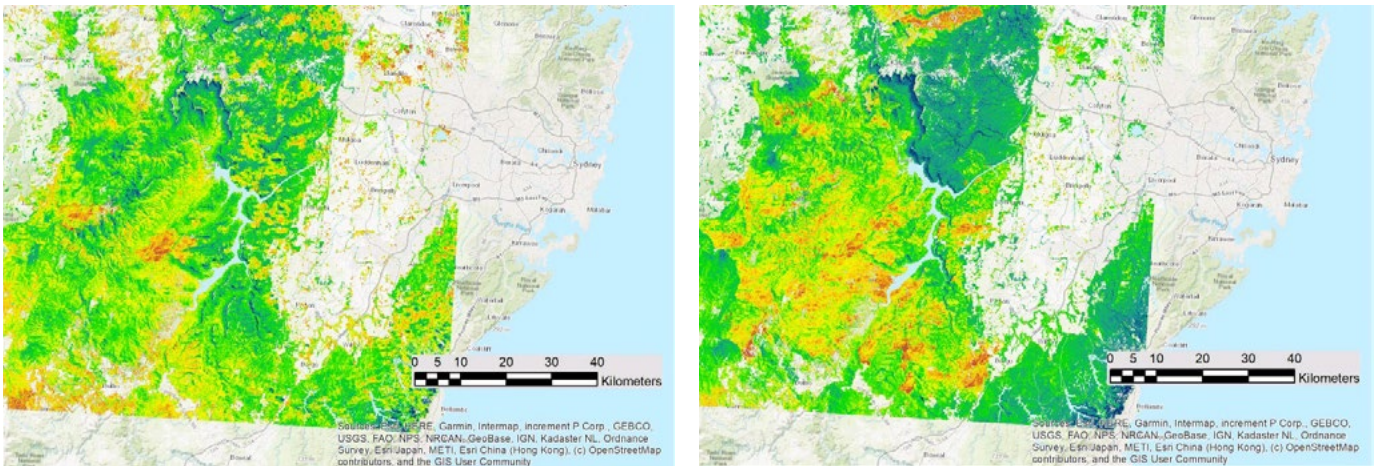


Figure 2. Maps showing the differences in spatial extent and variability of the bushfires in New South Wales between the 1st and 31st of December. Green means mostly untouched vegetation; the redder the colour, the higher the impact on the forests. Source: bit.ly/2V0PlcB

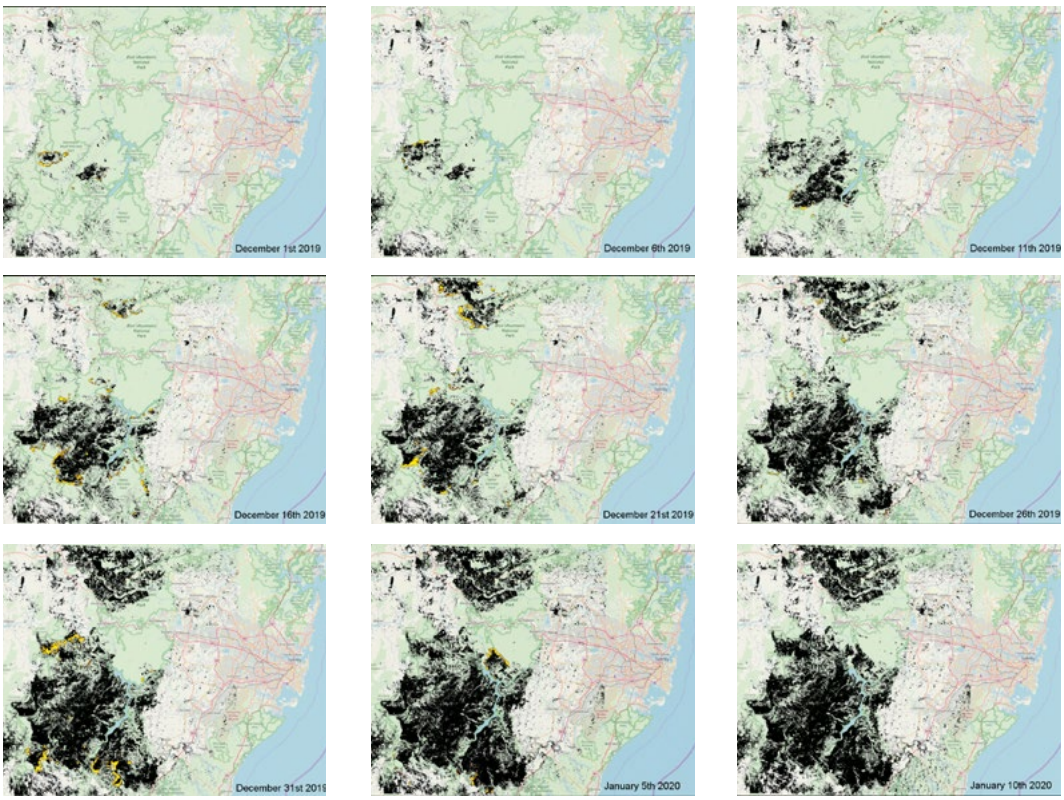


Figure 3. Maps showing the progression of the burned area and active fires for a fire near Sydney. Source: bit.ly/37B0Utv

Senior Lecturer in Environment and Engineering
Fenner School of Environment & Society and Research School of Aerospace, Mechanical and Environmental Engineering (both at the Australian National University)

Dr. Marta Yebra is a Senior Lecturer in Environment and Engineering at the Fenner School of Environment & Society and Research School of Aerospace, Mechanical, and Environmental Engineering, Mission Specialist of the Australian National University Institute for Space and Associate editor for Remote Sensing of Environment (journals.elsevier.com/remote-sensing-of-environment). Her research focuses on using remote sensing data to monitor, quantify and forecast natural resources, natural hazards, and landscape function and health at local, regional and global scales.

DR. MARTA YEBRA
marta.yebra@anu.edu.au

ARCTIC OCEAN SEA LEVEL RECORD FROM THE COMPLETE RADAR ALTIMETRY ERA

The polar oceans are often not included in global sea level estimates and can be seen as white spots on global sea level maps. This is because of the challenges inherent in determining polar sea level. One of these challenges is the changing sea ice cover. To find sea level anomalies in the sea ice cover, you have to look for leads, which are fractures of open ocean in between the sea ice floes. Leads are often much smaller than the satellite footprint, therefore the sea ice affects the returned satellite radar signal resulting in poorer coverage and a lower quality of the return signal. However, it is possible to separate the leads from the ice floes due to their flat surface which has a strong return.

The sea level anomaly (SLA) in the Arctic Ocean has increased 2.2 mm/year from 1996 to 2018 with a 95% confidence interval within 1.67–2.54 mm/year. In Figure 1, the time series from the combined altimetric sea level anomaly is shown with and without glacial isostatic adjustment (GIA). This is the conclusion of a paper published in Remote Sensing in 2019 (https://www.mdpi.com/2072-4292/11/14/1672?type=check_update&version=2). This is, to date, the most complete and precise study of the sea level changes in the Arctic Ocean. Data from four different radar altimetry satellites were used. This study is part of ESA's Sea level CCI (SL_CCI) and the Sea Level Budget Closure (SLBC_CCI), and is made as a joint study between the Technical University of Denmark (DTU) and the Deutsches Geodätisches Forschungsinstitut der Technischen Universität München (DGFI-TUM).

The average regional trend in the 22-year period is shown in Figure 2. This shows a large positive trend in the Beaufort Gyre, caused by increasing fresh water accumulation due to anti-cyclonic winds and Ekman transport. In Figure 3, SLA trends are given by cutting the time series with five years at a time, showing an acceleration in the Arctic Ocean sea level around 2004.

What do you think is the role or importance of remote sensing in the study of climate change?

I think remote sensing is an important player in the study of climate change due to the fact that remote sensing allows us to observe the actual state of our planet. We have learned a lot about the climate system from remote sensing studies. There is no other direct and precise way to, for example, measure the global ocean sea level state than by remote sensing. Remote sensing data are also used to verify climate models. The utility of remote sensing in the study of climate change is, however, limited by the relatively short time series we have, making it impossible for us to see the long-term climate effects.

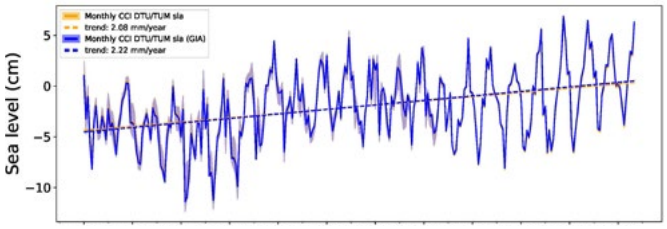


Figure 1: Monthly median SLA values with 95% confidence level with and witout GIA applied (from https://www.mdpi.com/2072-4292/11/14/1672?type=check_update&version=2)

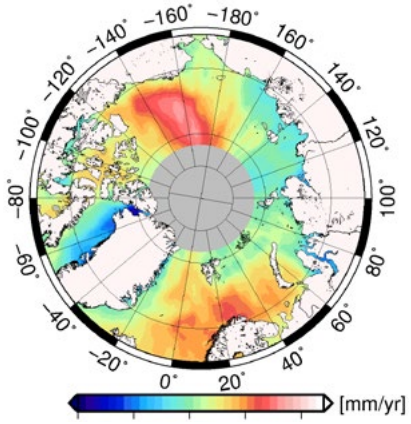


Figure 2: Regional SLA trend from 1996 to 2018 (from https://www.mdpi.com/2072-4292/11/14/1672?type=check_update&version=2).

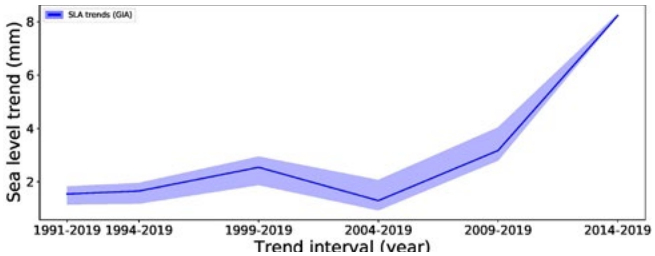


Figure3: SLA trends for various periods (from: https://www.mdpi.com/2072-4292/11/14/1672?type=check_update&version=2).

Post-Doctoral Researcher, Division of Geodesy and Earth Observation, DTU Space – Technical University of Denmark

Stine graduated in 2009 from the University of Copenhagen with a master's degree in Physics-Geophysics. In 2013, she graduated from DTU Space with a Ph.D. in remote sensing. During her Ph.D., she worked with satellite altimetry over sea ice in the Arctic Ocean. She have spent two years in industry before returning to academia and her current position as a postdoc. She's currently involved in satellite altimetry projects observing climate change in the Arctic and Antarctic Oceans.

DR. STINE KILDEGAARD ROSE
stine@space.dtu.dk

Dr. JOSEFINO COMISO

josefino.c.comiso@nasa.gov

SENIOR SCIENTIST (EMERITUS) |
NASA Goddard Space Flight Center

RESEARCH INTERESTS AND EXPERTISE:
Climate Change, Polar Oceanography, Sea Ice, Physics and Satellite Remote Sensing in the microwave, infrared, and visible regions.
(a) the detection of climate signals from historical satellite data;
(b) the role of Odden and polynyas in deep ocean convection and bottom water formation;
(c) biological processes and air-sea-ice interactions in the polar regions; and
(d) satellite sensor algorithms and radiative transfer modeling studies on sea ice and ice sheets.

Josefino C. Comiso was a Senior Scientist at the Earth Sciences Division of the NASA/Goddard Space Flight Center (GSFC) until 2017 when he retired and became a NASA Emeritus Scientist. He received his Ph. D. in physics from the University of California in Los Angeles, held a post-doctoral position at the University of Virginia in Charlottesville, and worked as a senior consultant for Computer Sciences Corporation before joining the Goddard Space Flight Center. At NASA/GSFC, his research led to new insights into many important processes in the polar regions including: (a) climate change signals as revealed by the accelerated decline of the perennial ice and amplified warming in the Arctic; (b) phytoplankton blooms and relationships with the sea ice cover and (c) deep ocean convection and bottom water formation as influenced by ice growth in polynyas and Odden. He has been the recipient of several awards, including the NASA Exceptional Achievement in Science Medal, NASA/GSFC Career Achievement Award and the PORSEC Outstanding Scientist Award. He served as a coordinating lead author of the IPCC-2013/WG1/AR5 report, contributing author of the IPCC 2007 report, and is the author or co-author of 7 books, 20 book chapters and more than 140 refereed journal articles – many of which have been highly cited.

Can you briefly tell us about your research interests? How did you start working for the NASA Goddard Space Flight Center? Can you give us some highlights in your career as a scientist and researcher in this world-renowned organization?

My current research interest is the study of climate and environmental changes as observed from space using satellite remote sensing data in conjunction with field and aircraft data. I got interested in working at NASA when they launched their climate change program and embarked on a project called "Mission to Planet Earth." Initially, the design of satellite sensors was relatively primitive – some of which were looking for practical applications. The Nimbus-5/ESMR is an example of such a sensor. It turned out that the most important application of the sensor was the study of the global sea ice cover, and I am glad to have been involved in such a study from the very beginning. Analysis of the data revealed for the first time the true spatial distribution and seasonal variability of the Arctic and Antarctic sea ice cover. In addition, the data led to the discovery of the large Weddell Polynya (an unexpected large open water area the size of California within the pack) in the 1970s that caused significant impact on the ocean in the region. Also, our discovery of large extents of coastal polynyas that are now regarded as the ice factories led to the conclusion that a large fraction of the sea ice cover in the winter comes from these polynyas. The ESMR was followed by more sophisticated and more capable sensors like SSMR, SMM/I, and AMSR. This provided me with the opportunity to develop new algorithms for these sensors, which were then used to put

> ***I got interested in working at NASA when they launched their climate change program and embarked on a project "Mission to Planet Earth". Initially, the design of satellite sensors was relatively primitive - some of which were looking for practical applications. It turned out that the most important application of the sensor was the study of the global sea ice cover, and I am glad to have been involved in such a study from the beginning.***

together a relatively long time-series data set that enabled us to assess how the global sea ice cover has changed over the last 4 decades. Similar studies were made on surface temperature using AVHRR and MODIS data to assess regional and interannual changes in the surface temperature over land, ice, and ocean and how these may impact the status of the cryosphere. Other data sets were also assembled and studied to allow us to better understand how the different parameters interact and affect each other. I would regard the many discoveries, studies, and insights into the changing climate of the region made possible by the existence of these data sets and reported in academic books, book chapters and ISI publications that were written with me as author or co-author as the highlight of my career at NASA.

You have worked on the applications of remote sensing for the cryosphere. Can you tell us more about it? What is the significance of studying the cryosphere and its importance in climate change research?

By cryosphere we mean the frozen part of the Earth's surface. This includes the glaciers, ice sheets, snow cover, sea ice cover, permafrost, and frozen lakes and rivers. It is sometimes called the global heat sink and is a key component of the Earth's climate system. It is expected that early signals of climate change will be first detected in the cryosphere because of ice-albedo feedback effects that serve to amplify the signal. The satellite-observed rapid decline in the Arctic perennial ice cover can be used to highlight the importance of studying the cryosphere. The ice sheet in Greenland has a sea level equivalence of 7 meters while the remaining glaciers in the Northern Hemisphere have a water equivalence of about half a meter. Also, stored in the permafrost is about 80 % of the world's methane gas that, if released, would exacerbate greenhouse warming. Furthermore, snow and store fresh water that millions of nearby residents depend upon.

The polynyas in the Antarctic and the Odden ice tongue in the Greenland Sea are also sites of deep-water convection and sources of bottom water that helps drive global thermohaline circulation. Any disruptions in circulation would drastically change the climate. Furthermore, the major part of the cryosphere is located in high-latitude regions which have been observed to be a highly productive regions in part because of meltwater from the sea ice that provides an excellent platform for photosynthesis.

A list of my publications can be found at https://neptune.gsfc.nasa.gov. Some of the pdfs could be downloaded from this link but other papers could be provided by sending an email requesting the specific paper or book chapter to josefino.c.comiso@nasa.gov.

What can you say about the current trends in climate change research? What is the role of remote sensing and spatial information science in delivering timely and reliable information on climate change to the general public?

The current trends in climate as inferred from the analysis of satellite remote sensing data and spatial information science are alarming. The data have contributed enormously in our ability to deliver timely and reliable information about changes in the climate. One of the most visible signals of climate change is the rapid decline of the Arctic perennial sea ice cover, an observation made possible because of long-term, continuous, and consistent measurements of sea ice extent using passive microwave radiometer data. Our ability to detect significant mass loss in the ice sheets of Greenland and Antarctica was also made possible by the advent of satellite sensors like GRACE, ICESat1, ICESat2, CryoSat2 and SAR sensors. Moreover, the observation of the accelerated rise in global sea level was also made possible by radar altimeters like the series of JASON satellites. Many other parameters have been used as providing climate change signals using satellite sensors, including sea surface temperature, sea surface topography, and extreme events such as super typhoons, extensive flooding, agricultural drought and uncontrollable fire events.

> ***The most important thing that people should know about climate change is that the climate signals and reported changes that indicate global warming are real and based on facts.***

In your opinion, how should scientists communicate the urgency of climate change? Can you share with us your perspectives on how Earth Observation has helped in addressing climate change and your contributions to the Intergovernmental Panel on Climate Change (IPCC)?

The urgency in making timely mitigation to reverse the current trend of climate change is discussed in detail in the IPCC 2014 report which I helped put together as one of the coordinating lead authors. The report indicated that it is unequivocal that the observed changes are mainly due to anthropogenic contributions, meaning that there is an anthropogenic solution as well. The important information that came out of the report is that if we keep the concentration of CO2 at a sustainable level (i.e., level in recent years), much of the negative changes observed would stabilize and the current state of the climate would not get worse. For example, surface temperature would not increase significantly more than present and the Arctic sea ice cover in the summer would survive. This is the kind of information that needs to be communicated to the public at a level that almost everybody can understand. It is extremely important that the public is convinced and become serious advocates of the urgency that steps towards immediate mitigation are needed to avoid dangerous climate change and its severe impacts.

What inspired you to work in this field? What do you consider your greatest achievement? Can you tell us a challenge that you faced in your career, and what did you learn?

What inspired me to study climate change was the result of the time series measurements of Charles Keeling at Mauna Loa, Hawaii about the trends in atmospheric carbon dioxide (CO2) gas. The unexpectedly high positive trend observed revealed that the doubling of CO2 that Svante Arrhenious predicted would cause a rise in global temperature by around 4 oC could happen within a century instead of 3,000 years as initially predicted. My greatest contribution to science are my studies on the sea ice cover that indicate a rapid decline of the Arctic perennial ice which I reported in 2002 and the companion paper on the accelerated increase in surface temperature in the Arctic reported in 2003. These two papers suggest that the summer ice in the Arctic that has been observed for at least 1450 years may completely disappear within a century – if not a few decades – if the trend continues. The observed accelerated warming in the region would make the Greenland ice sheet, which has a sea level equivalence of 7 meters, unstable and also cause the thawing of the permafrost and the loss of volume and area of the glaciers and snow cover in the Northern Hemisphere. A big challenge in my career has been the development of accurate and consistent climate data records on the sea ice cover, surface temperature, and other parameters. In this regard, I created the Bootstrap sea ice concentration algorithm that converts the digital satellite data to geophysical parameters. The algorithm has been adapted by NASA, JAXA, and some European Institutions to put together the time series of sea ice extent and ice area used for climate change studies. We validated the results using high resolution satellite data in conjunction with aircraft, ship, and submarine measurements. Satellite sensors also have finite lifetimes and data from the different sensors that make up the climate data record must be consistently derived. This was done by ensuring that during the periods of overlaps, the sensors provide similar, if not identical, values.

Based on your studies, what do you think is the most important thing that people should know about climate change? With the rise of youth engagement in raising awareness and fighting against climate change, can you share with us your opinion about the role of the youth in climate action?

The most important thing that people should know about climate change is that the climate signals and reported changes that indicate global warming are real and based on facts. They are based on actual observations or measurements the accuracies of which have not been refuted. The IPCC report also indicates that the warming is not due to natural phenomenon like those caused by a changing sun, volcanic eruptions, or internal variabilities such as El Niño, La Niña, Pacific Decadal Oscillation, Arctic Oscillation, Atlantic Meridional Oscillation and the Southern Annular Mode. Modeling studies also reveal that the observed warming can only be explained by the increase in greenhouse gases. The youth of today should be educated properly about the severe impacts of increasing greenhouse gases in the atmosphere so they can advocate strongly about the merits of mitigation. The many negative impacts of global warming should also be stressed as well, especially the more damaging ones that would severely compromise the quality of life of the future generations including their kids and their grand kids.

> ***"The youth of today should be educated properly about the severe impacts of increasing greenhouse gases in the atmosphere so they can advocate strongly about the merits of mitigation."***

GLOBAL ENVIRONMENT OUTLOOK 6 FOR YOUTH

Young people are severely affected by environmental changes they didn't cause. One-sixth of the world's population – some 1.2 billion people – fall between the ages of 15 and 24. However, young people can help to drive radical, system-wide changes to support a sustainable future and reach a circular economy.

GEO-6 for Youth is a project set up by and for the youth. It is a 'how-to guide" for a young person to understand how to live more sustainably. It also helps the youth learn more about the state of the environment, what can be done every day to change market trends, and how to choose a sustainable career. GEO-6 for Youth is here to help the youth understand the issue and, most importantly, show how the youth that they have the power to bring about transformative change – but there is a need to act now!

Twenty-eight authors from nineteen countries and two co-chairs have worked together to produce an interactive, youth-friendly, and engaging report with the United Nations Environment Programme (UNEP). Our aim is to translate high-level, scientific messages on the state of the environment to the youth, define how to create and access sustainable careers, and identify daily actions that can lead to a sustainable change. It is meant to stimulate dialogue within the youth community on environmental themes and issues, as well as to educate and provide capacity-building tools to foster active youth commitment for achieving sustainable development.

The report will be launched during the ECOSOC Youth Summit in New York on 1-2 April 2019. On that day, you will be able to access the e-book and interactive features of the report. In fact, to keep a low-carbon profile, the report will be available as an e-book and a downloadable pdf version. Engaging multimedia content and interactive features will be included in the online version. The launch event will also be mainly online, with online participation and social media content available for sharing on the UNEP's social media accounts.

GEO-6 for Youth is a derivative product of the Sixth Edition of the Global Environment Outlook (GEO-6), the UN Environment's flagship report, which outlines the current state of the environment, illustrates possible future environmental trends, and analyses the effectiveness of policies. This report shows how governments can put the world on the path to a truly sustainable future. It emphasizes that urgent and inclusive action is needed by decision-makers at all levels to achieve a healthy planet with healthy people.

2020 ISPRS NICE FRANCE

XXIV ISPRS CONGRESS

14-20 JUNE 2020

keydates

OCTOBER 2019	Opening of registration platform
OCTOBER 1, 2019	Deadline for Thematic Sessions and Tutorials
NOVEMBER 15, 2019	Deadline for ***very early bird*** Registrations Notification of applicants: Thematic Sessions and Tutorials
DECEMBER 15, 2019	Opening of abstract and paper submission platform
JANUARY 31, 2020	Deadline for submission to grants
FEBRUARY 03, 2020	Deadline for abstracts & full papers: technical sessions and young investigators
MARCH 02, 2020	Notification of authors for abstracts: technical sessions and young investigators
MARCH 30, 2020	Notification of authors for full papers: technical sessions, young investigators
APRIL 13, 2020	Deadline for ***early bird*** registrations Deadline for registration payment for papers to be included in proceedings Deadline for camera ready papers
MAY 04, 2020	Final program release
JUNE 02, 2020	Deadline for regular registrations

OPPORTUNITIES

PHD SCHOLARSHIPS AND FELLOWSHIPS

EPSRC iCASE Studentship - Integrating remote sensing and civil engineering for intelligent infrastructure monitoring
University of Cambridge, United Kingdom
Location: Cambridge, England
Deadline: 20th June 2020
http://www.jobs.cam.ac.uk/job/22951/

Land surface modeling, remote sensing and data assimilation
Katholieke Universiteit Leuven, Belgium
Deadline: 30th June 2020
https://www.kuleuven.be/personeel/jobsite/jobs/55540142

MASTER SCHOLARSHIP

Master's Geo-Information Science and Earth Observation
University of Twente, Netherlands
Deadline: 15th August 2020
(1) https://www.itc.nl/education/studyfinder/geo-information-science-earth-observation/#scholarships
(2) https://www.utwente.nl/.uc/f67/5337d10103a426ea00fabec404343d0b0076830a0300.pdf
(3) https://www.itc.nl/education/application-financial-support/scholarships/

OPPORTUNITIES

POSTDOCTORAL POSITIONS AND JOBS

Postdoctoral Scholar in Ecological Theory
The University of California, Santa Barbara
Deadline: 27th February 2020
hhttps://www.researchgate.net/job/938628_Postdoctoral_fellowships_in_Remote_Sensing_and_Modeling_of_the_Amazon_River-to-Sea_Continuum

Graduate Research Assistantship Announcement
Washington State University - Remote Sensing
Location: Pullman, Washington
Deadline: 28th February 2020
https://findajob.agu.org/document/0df5a66a-714d-458e-b59f-af7a838a851a.pdf

Assistant Professor in vegetation monitoring with active sensors (Fulltime)
Deadline: 28th February 2020
https://www.researchgate.net/job/938838_Assistant_Professor_in_vegetation_monitoring_with_active_sensors_fulltime

IN THE HORIZON

18-20 MARCH 2020

GIS Ostrava 2020, UAV in Smart City and Smart Region
Site: Ostrava,, CZECH REPUBLIC
Contact: Michal Kačmařík, michal.kacmarik@vsb.cz
Website: http://gis.vsb.cz/gisostrava/

23-27 MARCH 2020

LAGIRS 2020 – the Latin America GRSS & ISPRS Remote Sensing Conference
Site: Santiago de Chile, CHILE
Contact: Héctor Jaime Hernández Palma, jhernand@uchile.cl
Website: https://2020.lagirs.org/

20-22 APRIL 2020

SpaceTimeAI 2020
First International Symposium on Spatio-Temporal Artificial Intelligence
Site: London, UK
Contact: James Haworth, conference@spacetimeai.org
Website: http://spacetimeai.org/

03-05 JUNE 2020

27th International Conference on Systems,
Signals and Image Processing IWSSIP 2020
Site: Niteroi – Rio de Janeiro, BRASIL
Contact: Aura Conci, aconci@ic.uff.br
Website: http://iwssip2020.ic.uff.br/

14-20 JUNE 2020

XXIVth ISPRS Congress
Site: Nice, France
Contact: contact@isprs2020-nice.science
Website: http://www.isprs2020-nice.com

20-22 OCTOBER 2020

TeanGeo 2020
3rd International Conference & Exhibition
Advanced Geospatial Science & Technology
Site: Tunis, TUNISIA
Contact: El Hadi GASHUT, crtean.gashut@yahoo.com
Website: http://www.teangeo.org/

ACKNOWLEDGEMENT

"The ISPRS SC board would like to thank all the authors, contributors, and the coordinators of the featured articles who gave their time and shared their knowledge with all of us for the completion of this issue.

Also, our great appreciation to those organizers, participants, and volunteers who were involved in the previous ISPRS Summer Schools in South Korea and Brazil.

Lastly, we would like to acknowledge the members of the Newsletter team – Sandra, Ami, Vince, Franz, and Andre, for their continuous hard work on every issue of the SpeCtrum! Thank you!"