GRSG NEWSLETTER APRIL 2020

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GEOLOGICAL REMOTE SENSING GROUP
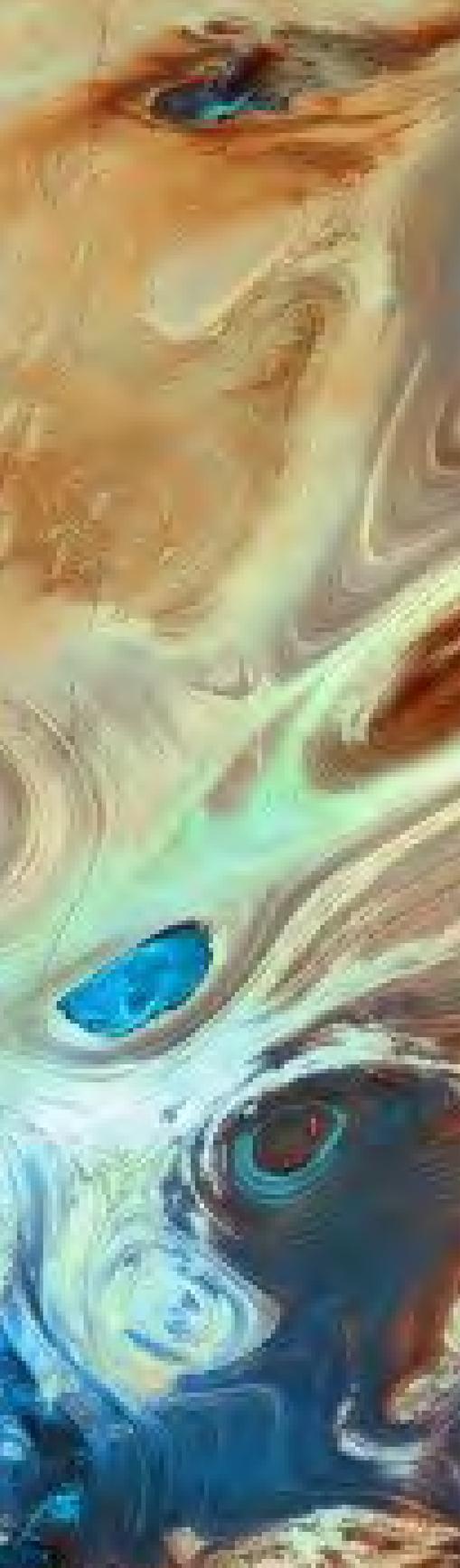
Welcome to the latest e-Newsletter from the Geological Remote Sensing Group.

NOTE: Newsletter introduction and textbook review extracted from original e-Newsletter published on 29 April 2021 by J. Ellis.

Dear Members

As 2021 progresses it is, for many, not yet much different to 2020. We continue to live in uncertain times but in many areas we are now seeing some light at the end of the tunnel.

We wrapped up 2020 with our first ever virtual GRSG which was a fantastic mix of shorter presentations and panel discussions and a geological quiz. It wasn't the same as being with you all but we hope you enjoyed being part of something a bit different from us which was a nice way to wrap up the end of a year of virtual meetings.

You will be hearing more about that event a later in the year in the lead up to this year's event.

As we look forward to this year though we are hopeful of an in-person event in December but we are exploring hybrid options. This will allow us to also retain a virtual element to our program to continue to make it accessible to all, in anticipation of any restrictions that may still be in place by that time.

So our first big announcement for 2021 is to save the date for 13-15th December 2021 for the 32nd International Geological Remote Sensing Group conference and AGM to be held at our home the Geological Society, London. We can't wait to see you all, or as many as possible, again in person.

Also later this year we will be hosting a virtual Energy focused event through our US representatives. This event is still in the planning and will be in an August/September time frame. More details, including a save the date will be released very soon.

As always with the newsletter we try to capture the news and updates from across the community and have some excellent articles and news items this time around.

To pick a few we have a great article on use of thermal data over coal fields in South Africa using ITRES' TABI and updates on new missions coming soon such as Pleiades NEO and even a book review.

Our newsletters are collated by a dedicated team but we actively encourage, and need, your inputs so read more about their plans and how you can help later in this newsletter.

For 2021, other than the events mentioned, we also plan to run virtual training courses based upon Google Earth Engine and Python, and we are proud to be a co-badge for this year's 2021 William Smith Meeting under the title of "Geological mapping – of our world and others".

Our world has definitely changed over the last year and we continue to adapt to find ways to interact and bring value to the community and please don't hesitate to get in touch with us.

We love to hear from you with comments, thoughts, ideas, content for our newsletter or other feedback, not least because we do rather miss speaking to you and seeing you all in person!

For now we hope you all continue to take care and stay safe wherever you are in the world and we hope to see you later this year!

Best wishes

Charlotte
Charlotte Bishop, Chair GRSG

BOOK REVIEW

Remote Sensing – Principles, Interpretation and
Applications (4th Edition) Floyd F. Sabins and
James M. Ellis, published in 2020

Way back in time, in the early 90s, when a ¼ scene of a 30m resolution Landsat TM footprint cost US$1,500 and PCs could manage to mosaic perhaps a few TM scenes at a time, I was lucky enough to attend an ERIM (Earth Resources Institute, Michigan) conference in Pasadena in 1993. I had persuaded my boss, Nigel Press, the owner and founder of NPA even further back, in 1972, to let me attend the workshop on the back of another conference in Houston, the rationale being that the best and most well-known remote sensing geologists would be there and it would be a huge opportunity to learn and see how these, mostly oil company-employed geologists, plied their trade. The names will be known to some of our present members, but possibly not all: Gary Prost, Zeev Berger, Geoff Lawrence, Billy Laughlin, Rebecca Dodge, John Berry, Vern Singhroy and Jonathon Pershouse to name those I can remember. Also present were Floyd Sabins and Jim Ellis – the authors of the Remote Sensing – Principles, Interpretation and Applications (4th Edition, 2020). The meeting was a revelation to me and it changed the way I thought about and practised remote sensing.

Sadly, Floyd Sabins passed away before the final publication of the 4th Edition, but along with Jim Ellis, they have combined to produce more than a textbook – it's a compendium of modern geological remote sensing techniques and applications, lavishly illustrated, including over 100 full colour images and hundreds of B&W images and figures from across the globe. Additionally, and more importantly, there is a dedicated website containing 27 examples of imagery in ENVI or geotif format that can be downloaded and studied by following ample instructions, complete with exercises. Six more chapters have been added to the book and cover areas that have hugely expanded since the publication of the 3rd edition, for example DEMs, LiDAR and drones/UAVs. A video and pdf introduce the online content to the Laboratory Manual and provide a succinct introduction to the book.

The book is divided into three sections, the first 8 chapters being devoted to introducing the basic physics, image characteristics and terminology and expands on the range of sensor platforms, from aerial photos, through multispectral, thermal and radar to elevation and LiDAR, that are all now frequently used by practitioners of remote sensing. Structure from Motion – SfM, is briefly introduced and shows that even amateur-level cameras can be utilised to collect, process and produce photogrammetrically controlled datasets. There is even mention of remote sensing with mobile/cell phones, although the book was published before the new LiDAR-enabled iPhone 12. Each chapter contains sets of questions and key references for readers to use to as a foundation for further, enhanced study.
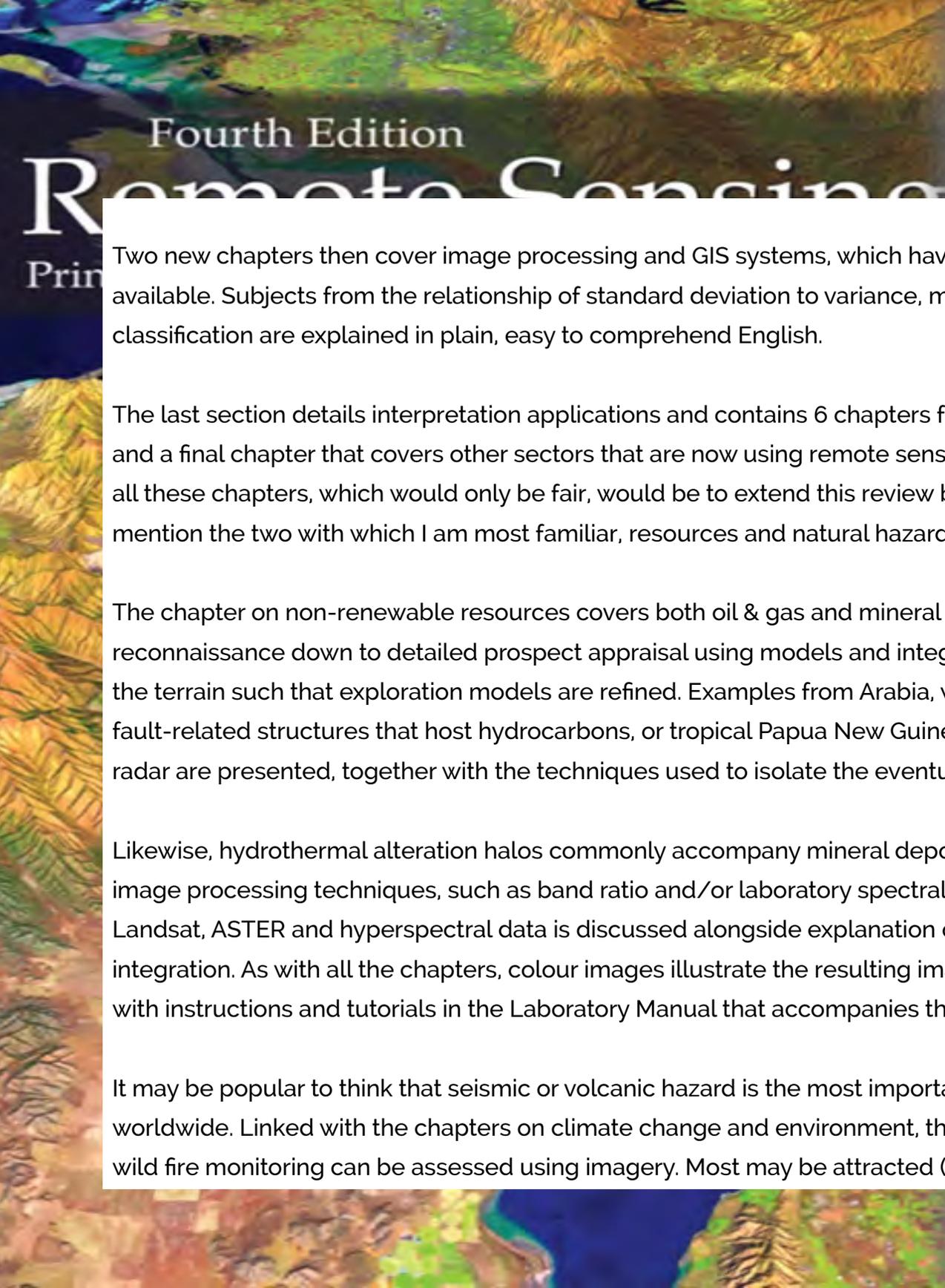
Two new chapters then cover image processing and GIS systems, which have similarly grown to accommodate the variety and number of platforms now available. Subjects from the relationship of standard deviation to variance, map projections, georeferencing, band ratios and image enhancement and classification are explained in plain, easy to comprehend English.

The last section details interpretation applications and contains 6 chapters focusing on the environment, resources, land cover, geohazards, climate change and a final chapter that covers other sectors that are now using remote sensing, such as humanitarian, archaeological and public health sectors. To describe all these chapters, which would only be fair, would be to extend this review beyond that which I would hope to be a succinct review, so I have chosen to mention the two with which I am most familiar, resources and natural hazards.

The chapter on non-renewable resources covers both oil & gas and mineral exploration, briefly explaining the usual practice of exploration from regional reconnaissance down to detailed prospect appraisal using models and integrated datasets. These might use optical or passive radar platforms to illuminate the terrain such that exploration models are refined. Examples from Arabia, where subtle surface dip changes have been interpreted and mapped buried fault-related structures that host hydrocarbons, or tropical Papua New Guinea, that is tree-covered and cloud-bound most of the year, necessitating use of radar are presented, together with the techniques used to isolate the eventual discoveries.

Likewise, hydrothermal alteration halos commonly accompany mineral deposits and provided cloud-free images can be acquired, then a range of different image processing techniques, such as band ratio and/or laboratory spectral analysis, can differentiate mineralised and non-mineralised zones. The use of Landsat, ASTER and hyperspectral data is discussed alongside explanation of exploration strategy that emphasises the importance of planning and data integration. As with all the chapters, colour images illustrate the resulting imagery and a hyperspectral dataset is included in the online Digital Database, with instructions and tutorials in the Laboratory Manual that accompanies the book.

It may be popular to think that seismic or volcanic hazard is the most important, but flooding is the biggest hazard in the US and comprises 40% of hazard worldwide. Linked with the chapters on climate change and environment, the chapter sets out how these naturally (or not) occurring hazards, including wild fire monitoring can be assessed using imagery. Most may be attracted (as I was) to the sub-sections on interpretation of seismic and volcanic risk, ably

mapped by radar interferometry, plain very high resolution imagery and airborne LiDAR. Most important to realise though is that these studies highlight mitigation, not prediction.

In summary, in 520-odd pages, the book offers a concise but at the same time, detailed review of the basic physics, array of platforms and sensors, interpretation techniques and applications, in full colour and with extensive referencing. It is packed with illustrative examples and covers the full spectra of geological niches where such information and analysis have leverage and provides a set digital tutorials and linked online database for those without the specific data to learn and practice with.

Who should buy this book? It is aimed at undergraduates and graduates that are enrolled in courses on geology with remote sensing (or the other way around) and for those that provide such courses, as a template for study and a framework to build on for more elaborate learning and analysis. It is structured with this in mind, having been the basis for existing courses at several institutes; the extensive data offered as part of the package contained within the Remote Sensing Digital Database and Image Processing Lab Manual, both accessed via the online component of the book, are an integral part of this approach. But I suspect it will be useful resource for many more…

Since I have been a member of the GRSG, I have been taken by the fact that our members are quite often (but certainly not always) geologists OR image processors: this book will help to break this down so that geologists can understand what the technique is capable of and practice it themselves and that image processors will appreciate more fully what geologists want to do and enable them to do more. I can thoroughly recommend this book to both audiences, in the hope that they become one.

Remote Sensing – Principles, Interpretation and Applications (4th Edition) by Sabins and Ellis is available to buy (~ $90) from Waveland Press: http://waveland.com/browse.php?t=421

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