Quantifying the benefits & challenges of hyperspectral remote sensing: *Looking toward the future of space-borne radiometry*

Introduction & Meeting Objectives

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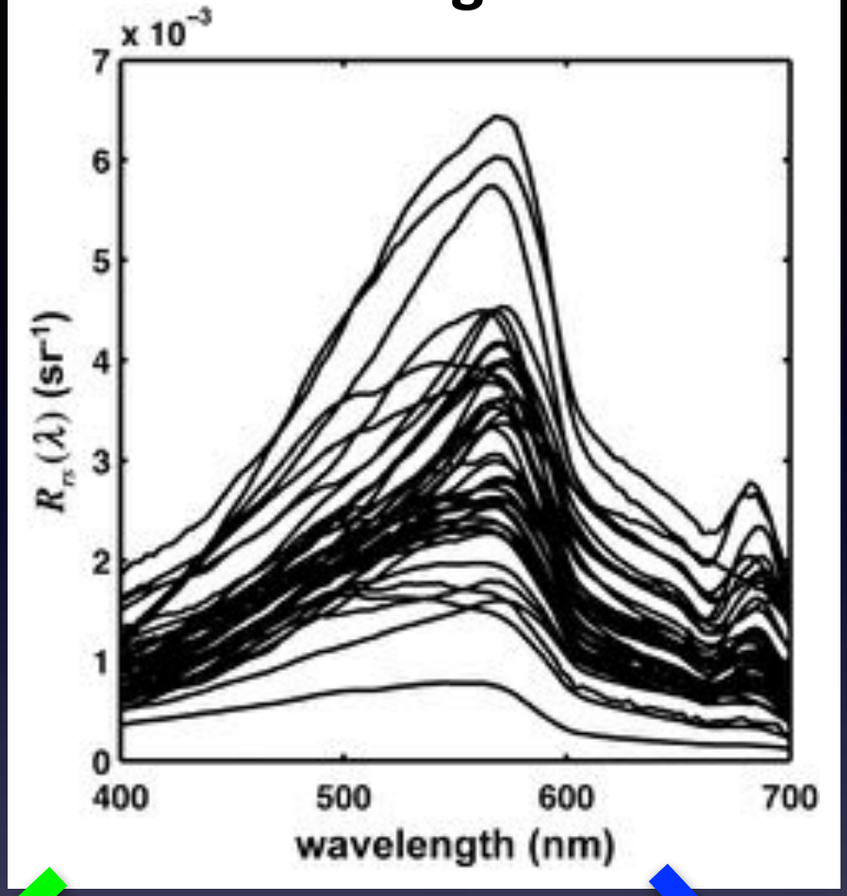
State of the art - where are we now?

Remote sensing reflectance



blue:green ratio algorithms

chlorophyll concentration

backscattering, b_b

$$R_{rs} \approx G \frac{b_b}{a + b_b}$$

semi-analytical inversion algorithms

absorption, a

inherent optical properties (IOPs) - a, b_b

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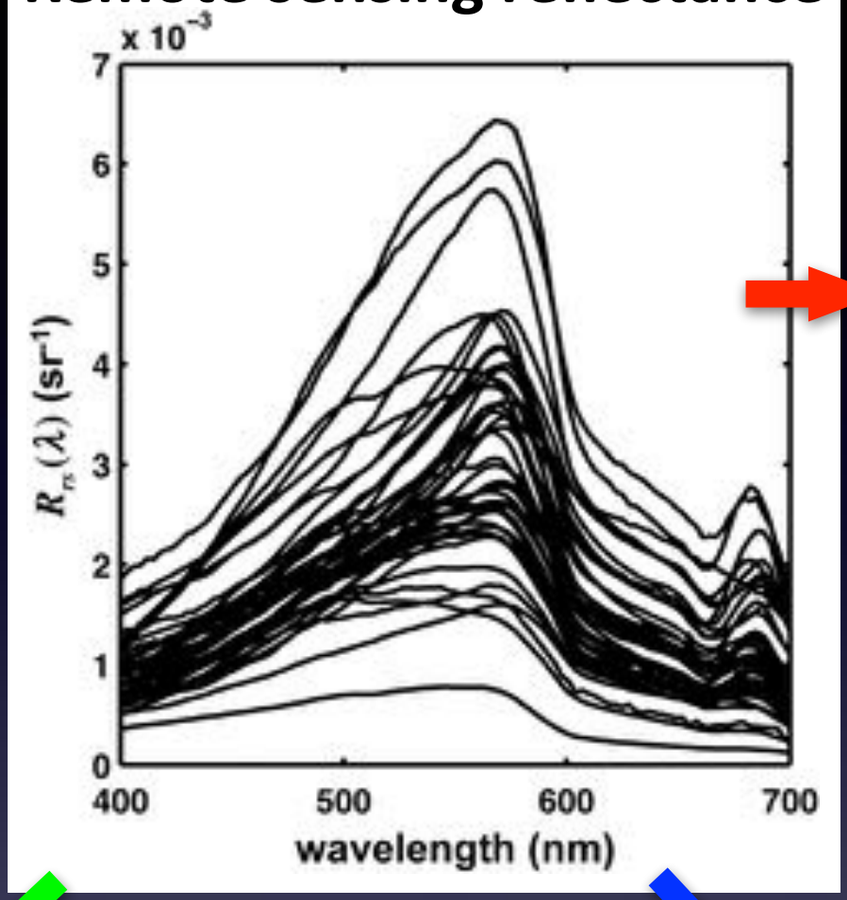

Empirical approaches, some machine learning,…

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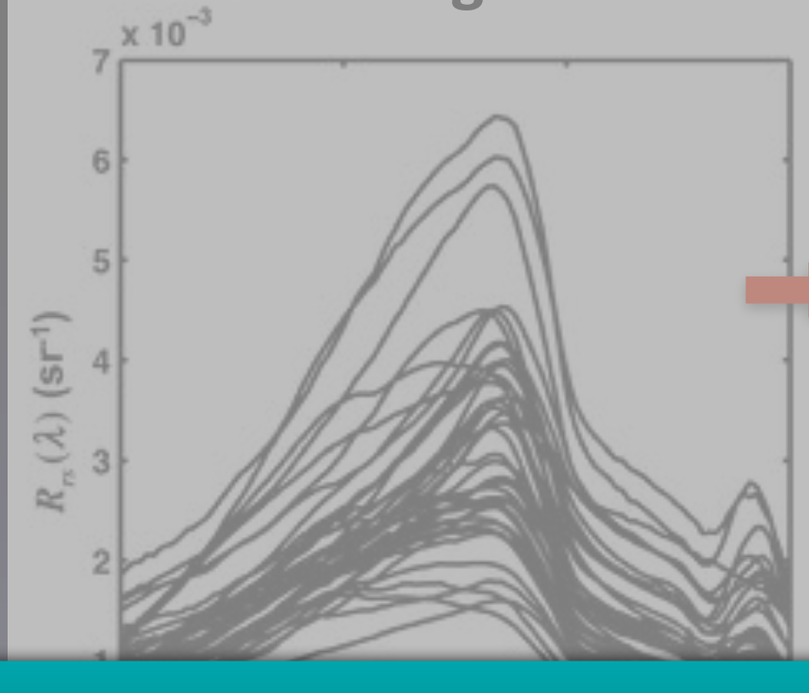

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Will these approaches be adequate for extracting information from a new era of hyperspectral data?

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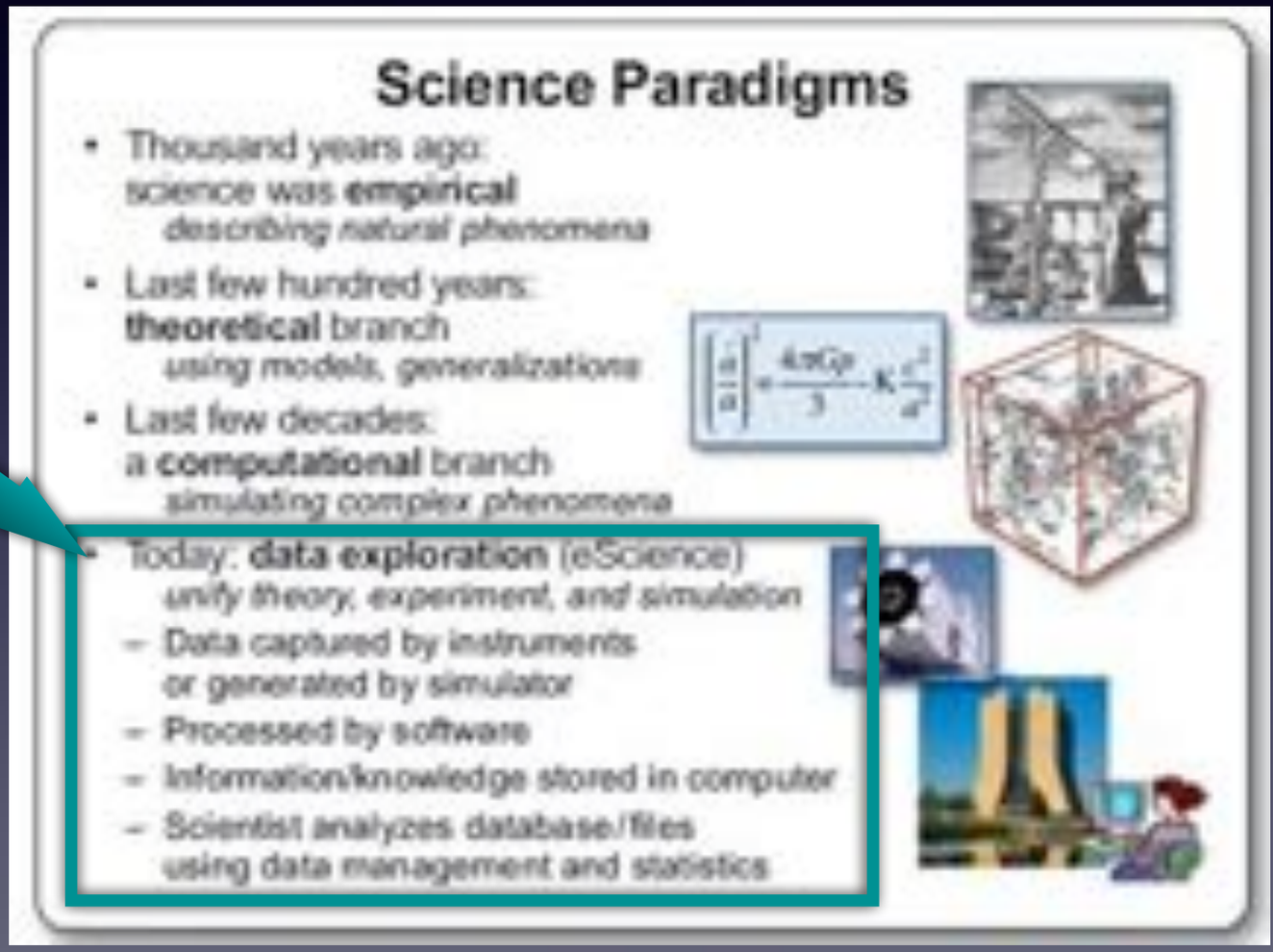
Some thoughts

- Likely not!
- Hyperspectral data will be collected from satellites and an increasing array of other platforms

- Era of ‘big data’ or ‘The Fourth Paradigm’

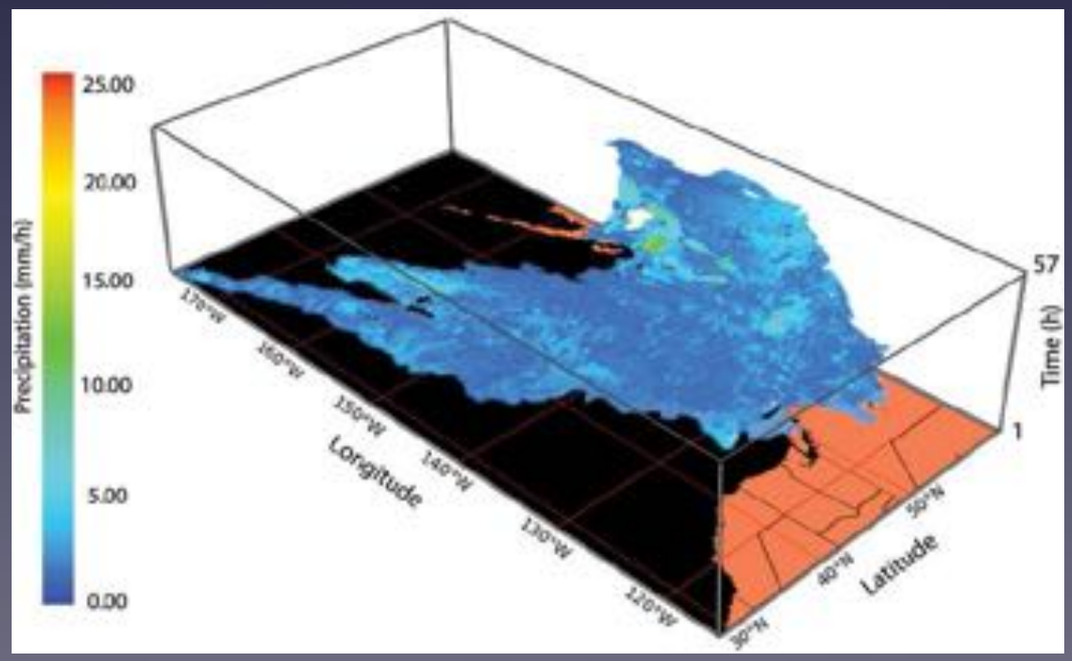
- Need more sophisticated approaches to fully exploit hyperspectral & other contextual Earth system data



The Fourth Paradigm: Data-Intensive Scientific Discovery [*Hey et al.,* 2009]. Based on the work of Jim Gary, computer scientist

Some thoughts

- Currently we are not certain <u>how</u> hyperspectral will improve our knowledge about the ocean
- THIS IS OK!!
- Machine learning and statistics can help us discover unknown properties or patterns contained in data
- Hyperspectral isn't just multispectral with more bands!
- Ocean colour signals → relationships with the Earth system
- This is what we're striving for!



Sellars et al. (2013), EOS, 94(32), 277-288
Case study of object-oriented analysis of precipitation

Our action items

- Gather ideas from the community
- Formulate into specific recommendations for space agencies
  - ★ *Remember: this is an opportunity for us to voice our collective opinion*
- What avenues should we investigate?
- What needs to be done to facilitate these investigations and, ultimately, advance our field?
- *Let's NOT get stuck in a discussion of what we already know*

Our challenge

- Think outside the box (data cube!)
- Be open minded - are there overlaps/collaboration opportunities you may not have previously considered?
  - e.g. I'm currently working with computer scientists who study medical imaging!

And go…