

# Introduction to Scientific Writing

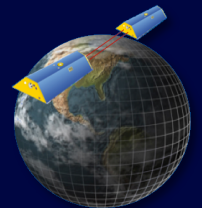
**Jianli Chen**

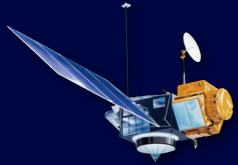
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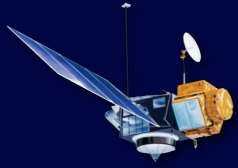


# Scientific Paper

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- ❖ **A scientific paper is a written publication describing original research results.**
- ❖ **A paper is an organized description of hypotheses, data and conclusions, intended to instruct the reader.**
- ❖ **Then, why do we need scientific papers?**

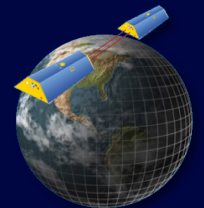


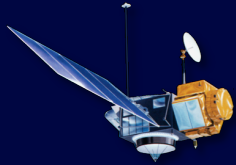


# Types of Scientific Writing

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- ❖ **Research Paper**
  - ❖ **Full paper**
  - ❖ **Communication or letter**
- ❖ **Review Paper**
- ❖ **News or Summary on a Specific Research Findings**
- ❖ **Book Review**
- ❖ **Book & Book Chapters**





# Types of Scientific Writing

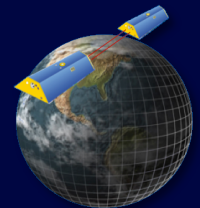
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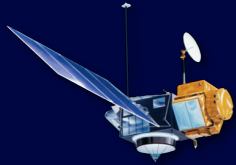
## ❖ Full Paper

- ❖ To present relatively complete results on a specific topic
- ❖ There is no length restriction in general
- ❖ Formats depend on journals

## ❖ Short Paper

- ❖ Communication, letter, or report
- ❖ Significant results with broad impact
- ❖ Length restrictions
- ❖ Special formats





# Types of Scientific Writing

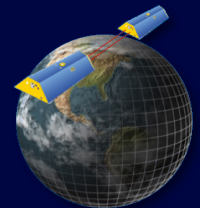
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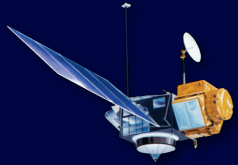
## ❖ Review Paper

- ❖ Summary of the knowledge or recent progresses in a scientific field
- ❖ For specialists or general audience
- ❖ Usually invited by the publisher
- ❖ No length restriction in general

## ❖ Book & Book Chapters

- ❖ Mostly controlled by publisher and editor
- ❖ Sometimes by invitation

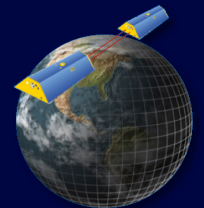


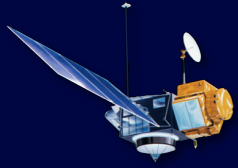


# Writing Process

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- ❖ **Outline**
- ❖ **Organize the results**
- ❖ **Styles of a paper**
- ❖ **Usage of language**
- ❖ **Revision**

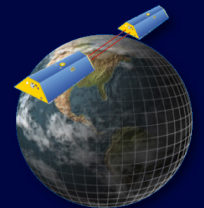


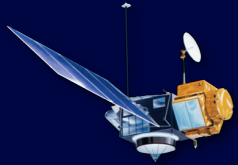


# Why is Outline Essential?

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- ❖ **A blueprint of a paper**
- ❖ **Organize the key points of a paper**
- ❖ **List the objectives, hypotheses, and conclusions**
- ❖ **Contains little text, but the backbone**
- ❖ **Organize the figures**

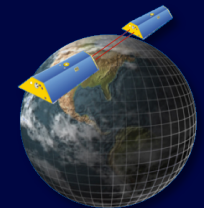
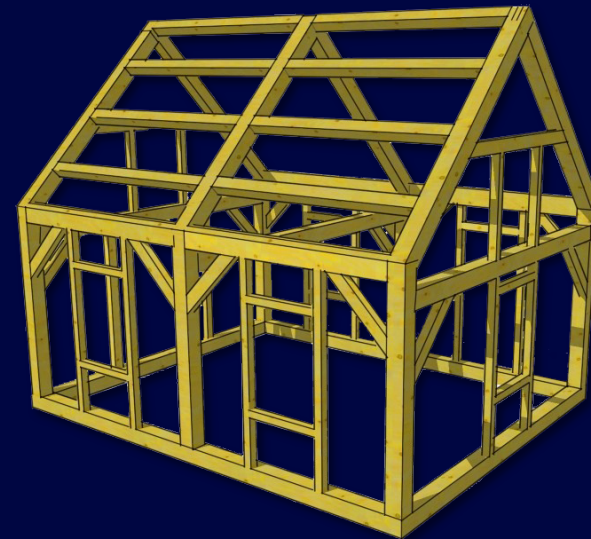




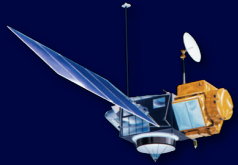
# Construction of an Outline

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- ❖ **Title**
- ❖ **Authors**
- ❖ **Abstract**
- ❖ **Introduction**
- ❖ **Results and Discussion**
- ❖ **Conclusions**
- ❖ **Acknowledgement**
- ❖ **Reference**
- ❖ **Experimental or Supplemental Materials**





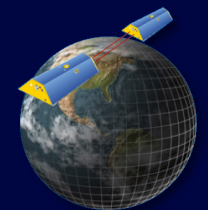


# Title of a Paper

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- ❖ **Brief (usually <10 words)**
- ❖ **Specific and Informative**

**In preparing the title, remember one thing: thousands of people will read the title, and from among those people will emerge those who actually read the paper. Thus, a poor title is among the surest ways to assure your paper will not be read, therefore a good, informative title is the way to encourage readership.**



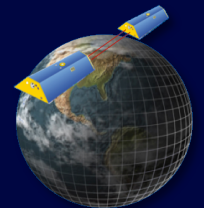


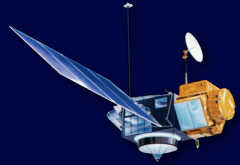
# “Introduction”

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**The Introduction is a critical part of a manuscript because it is here that you introduce your paper by stating the reason for the paper's existence. If the problem (i.e., scope) of the paper is not stated clearly and understandable, the reader will have little interest in your solution and often reads no further. Here are a few "rules" of a good introduction:**

- ❖ **Review related literature so as to orient the reader.**
- ❖ **Clearly present the nature and scope of the problem to be investigated. This statement justifies the paper, often by highlighting an unanswered question or contradicting a hypothesis.**
- ❖ **State your objectives or purpose of the paper briefly but clearly so the reader now knows exactly the purpose of the paper.**
- ❖ **Many manuscripts are rejected, in large part, because the Introduction did not convince the referee that the study was worthwhile.**

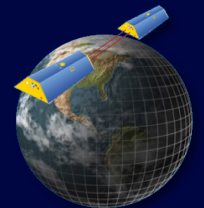


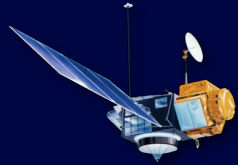


# “Results and Discussion”

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**The watchwords for the Results section are to be accurate and concise. This section often summarizes information contained in tables and figures presented elsewhere in the paper. The important point here is to emphasize the main points of the data and never to repeat in the text the information contained in tables and figures. The basic rule: report the major versus “statistically significant” findings, recognizing that the significant findings are those you intend to revisit in the Discussion. Let the tables and figures handle the data details.**





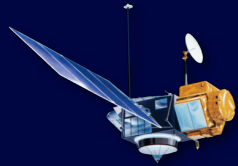
# “Results and Discussion”

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The Discussion is where you interpret your results, which often makes this section the most difficult part of the paper to write. Indeed, many papers submitted for publication are rejected not for lack of quality data, but because of a poor Discussion section. A most important principle here is to make the paper come “full circle” by discussing the data in the context of the justification and objectives stated in the Introduction. If the Discussion does not relate to these important points, the paper loses its ability to convince and to summarize within a specified context.

Generally, the Discussion answers the following questions: what did the results mean and why did they come out as they did. In answering these questions, you usually will be comparing your work to the findings of others.





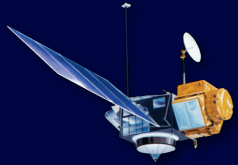
# “Results and Discussion”

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The following points are among those that should be considered in writing the Discussion:

- ❖ Look to present the principles, relationships, and generalizations as evidenced in the Results. Remember, too, the point of the Discussion is to discuss the results, not to repeat what was already presented in the Results section.
- ❖ Emphasize exceptions and contradictions to other work as well as agreements with work of others.
- ❖ State your conclusions as clearly as possible and based on the data in the paper. Many Discussion sections suffer badly from reporting what an author “knows” about the topic versus what the data actually support.
- ❖ Speculation should be clearly stated as such and limited but not omitted, and suggestions put forth for future or additional research.

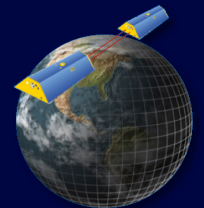


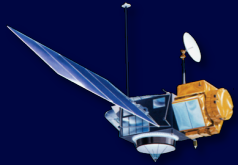


# Style of a Paper

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- ❖ **Figures:** labels, units, font size, symbol size, figure size
- ❖ **Images:** contrast, unit length, visual appealing
- ❖ **References:** different styles for different journals.

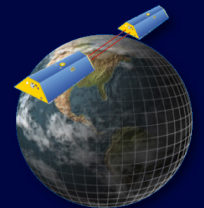


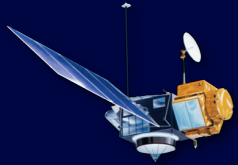


# Revision

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- ❖ **Everyone has a blind spot.**
- ❖ **A good manuscript needs to revise many times.**
- ❖ **Spelling check.**

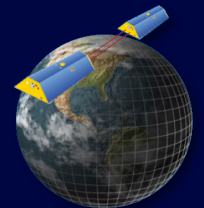




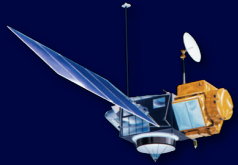
# Publication Process

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- ❖ **Finalize your manuscript with the agreement from all the co-authors**
- ❖ **Submit to the journal editor electronically or by mail**
- ❖ **Peer-review process**
- ❖ **Decision from the editor**
- ❖ **Revise, resubmit, and accepted**
- ❖ **Proofreading (last chance to revise)**
- ❖ **Published**



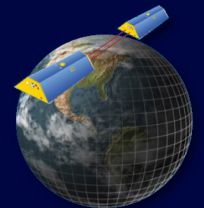


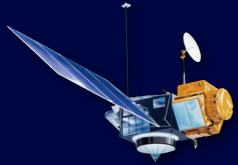


# Ethics

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- ❖ **Authorship**
- ❖ **Originality**
- ❖ **Copyright**
- ❖ **Plagiarism**
- ❖ **Duplicate submission**



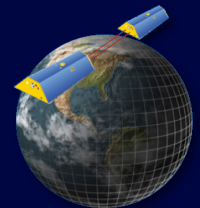


# Publication-Quality Graphics

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## ❖ Tools

- ❖ **MATLAB (& Mapping Toolbox)**
- ❖ **IDL (Interactive Data Language)**
- ❖ **Adobe Photoshop & Illustrator**
- ❖ **GMT (Generic Mapping Tools)**
- ❖ **GraphicConverter (Mac) (or PC equivalents, e.g. Paint)**
- ❖ **PowerPoint (yes, also a powerful tool for producing high quality graphics)**

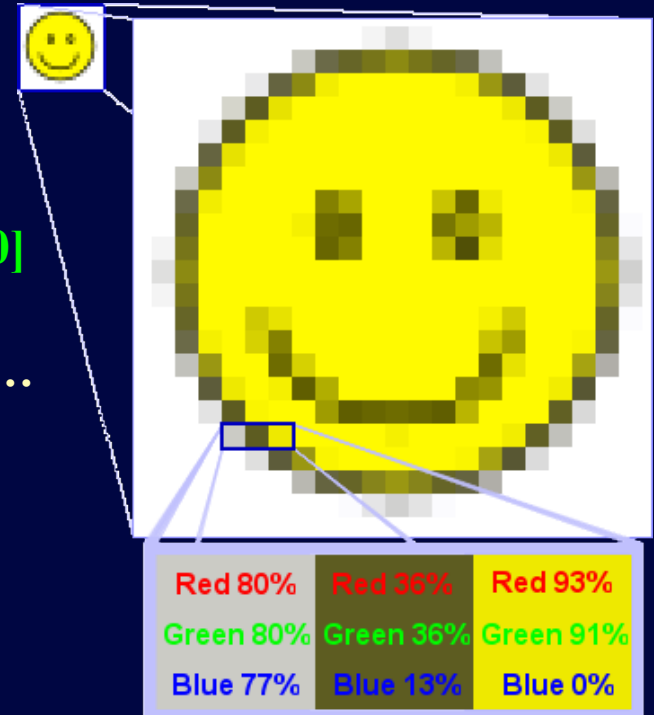


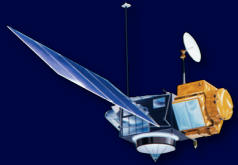


# Understanding the Nature of Graphics

## ❖ Raster Graphics

- ❖ A raster graphics image or bitmap is a data structure representing a generally rectangular grid of pixels, or points of color.
- ❖ Color Index (RGB, CMYK)
- ❖ [255 255 255], [255 0 0], [0 0 255], [0 255 0]
- ❖ Formats: BMP, JPEG, PNG, TIFF, GIF, ...

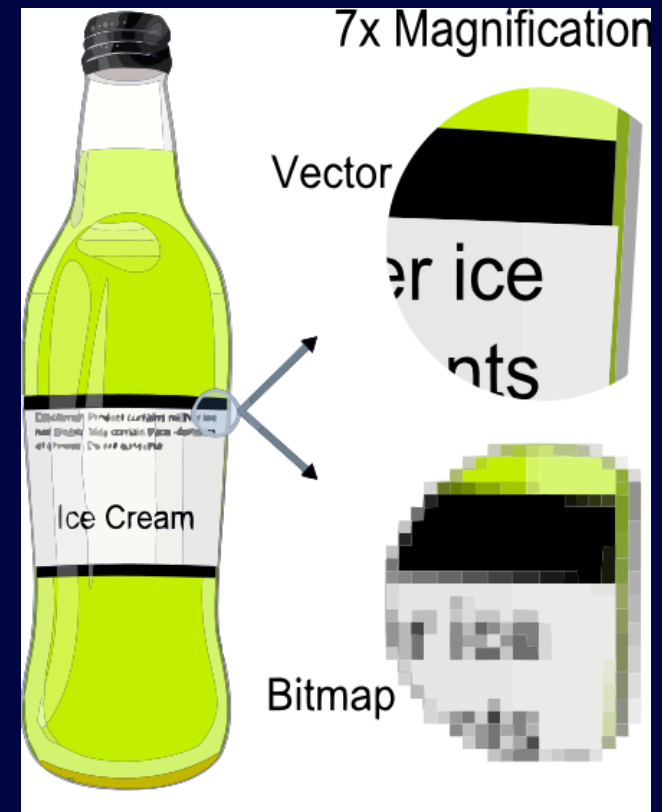




# Understanding the Nature of Graphics

## ❖ Vector Graphics

- ❖ Based on the use of geometrical primitives such as points, lines, curves, and shapes or polygon(s), which are all based on mathematical equations, to represent images in computer graphics.
- ❖ No virtual limitation on resolution.
- ❖ Formats: CGM, SVG, WMF, ...





# Understanding the Nature of Graphics

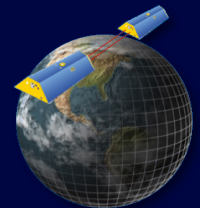
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## ❖ Compound Graphics Formats

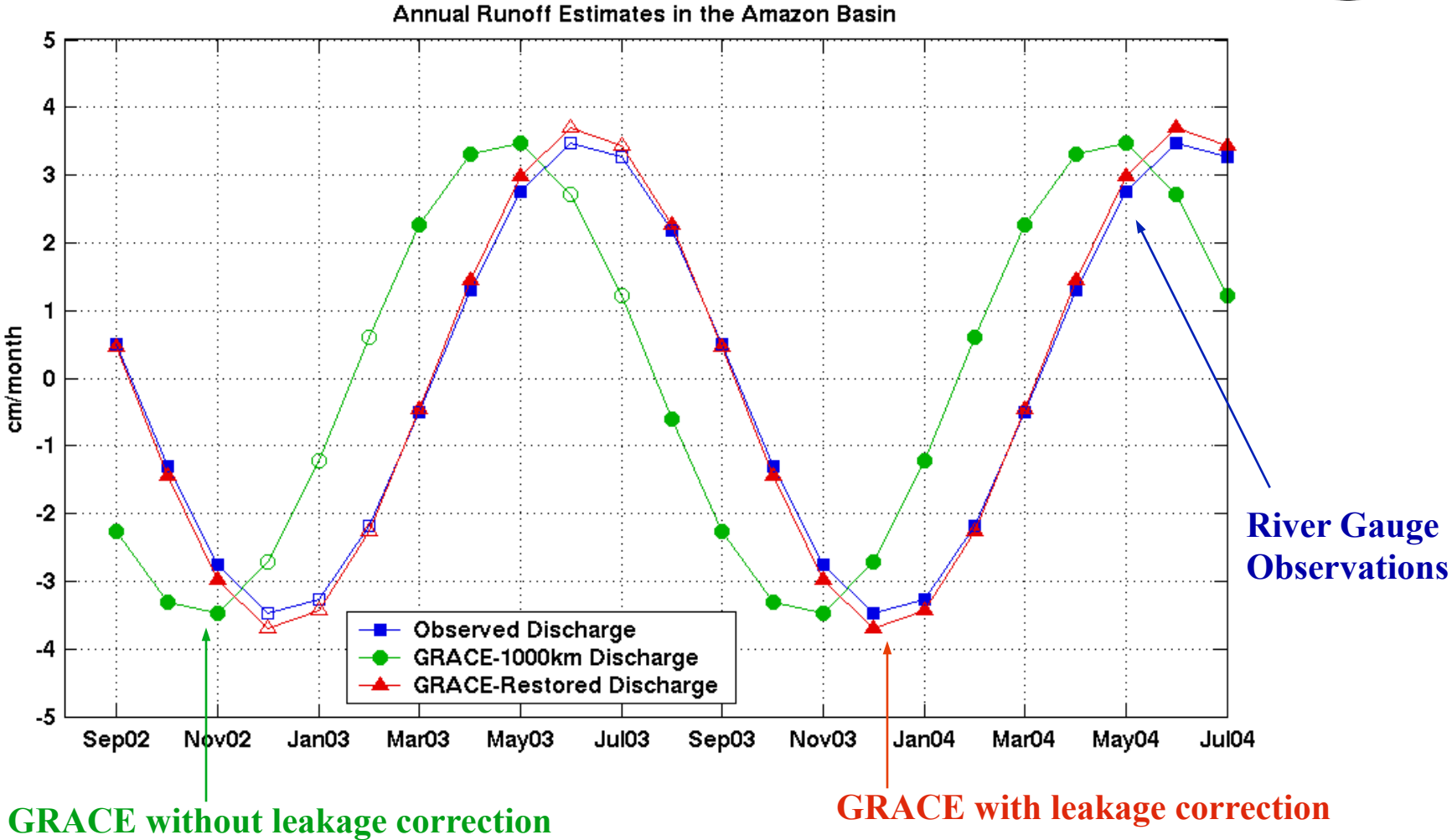
- ❖ EPS (Encapsulated PostScript)
- ❖ PDF (Portable Document Format)

To retain the original resolution of inserted graphics, and not lose resolution of texts.

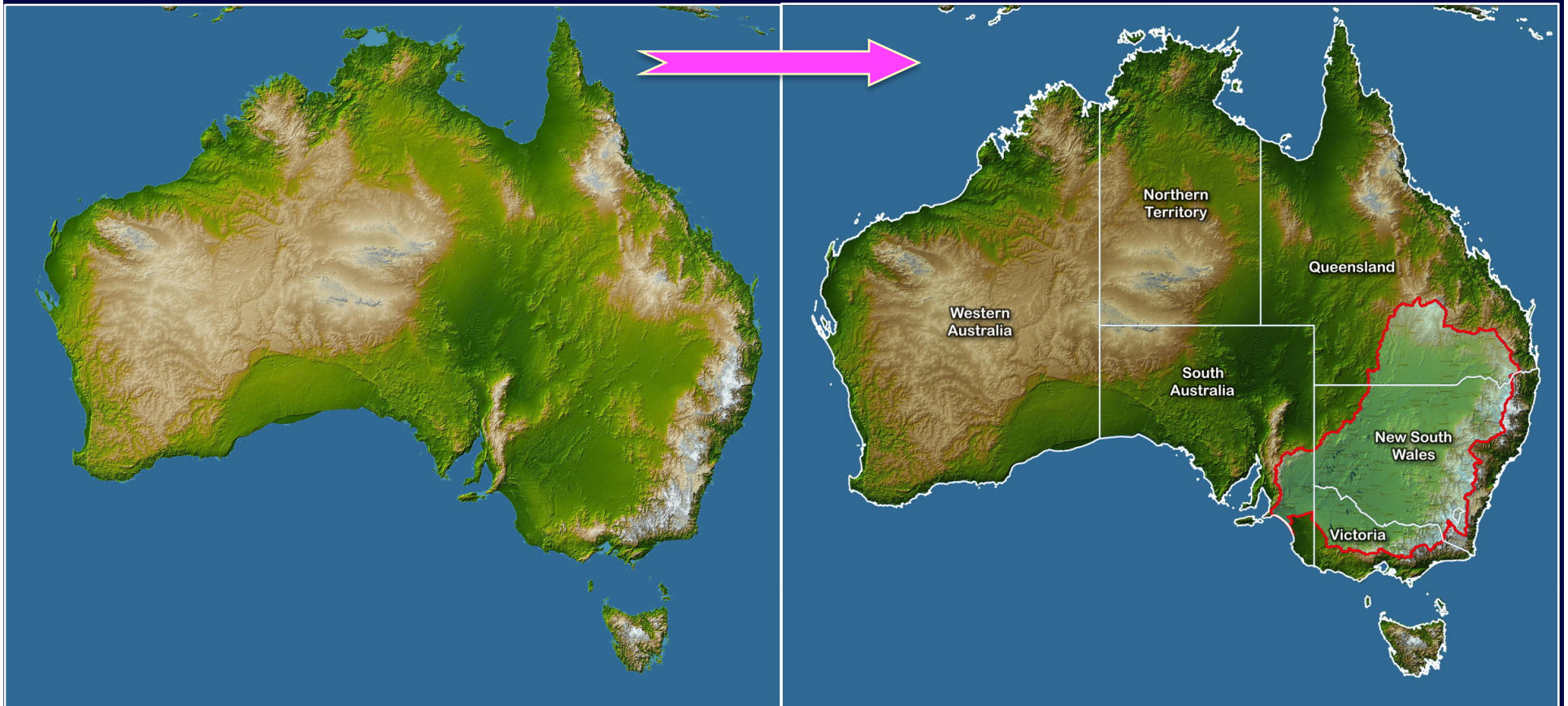
EPS/PDF -> Regular graphics formats (jpeg, png, ...)



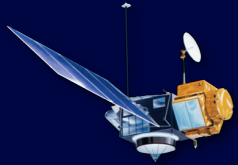
# The Flexibility of MATLAB



# The Power of PowerPoint



PPT → PDF → JPEG/PNG



*Thanks!*

