ICCP Working Group
Identification of Primary Vitrinite in Shale
2017 Report

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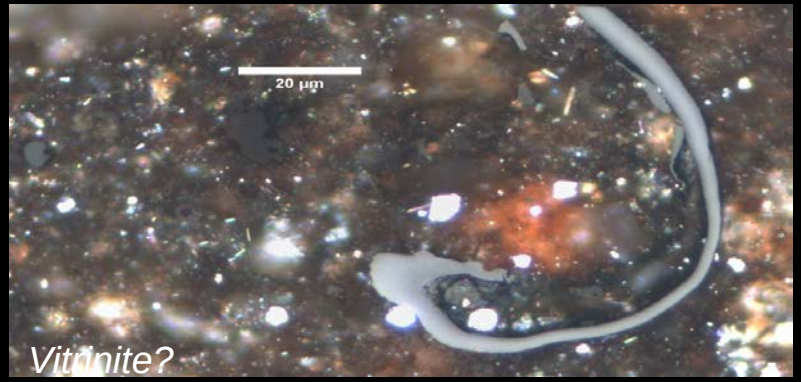
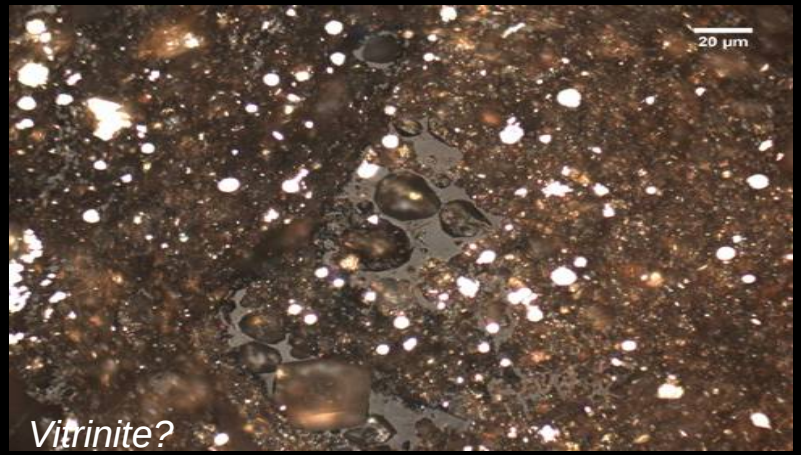
Outline

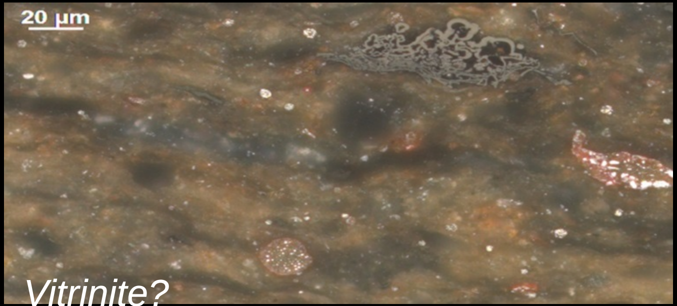
- Problem to be solved
- History of the ICCP working group
- Findings and products to-date
- 2015-2016 exercise and results
- Summary

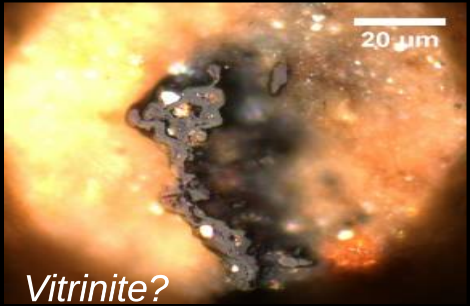




Objective of the Working Group

- Provide guidelines for identification of the primary vitrinite population in dispersed organic matter



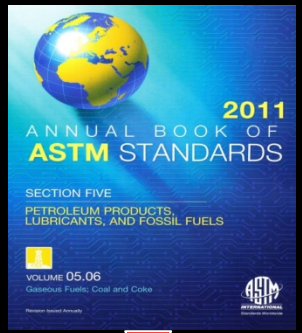


Identification of primary vitrinite: History of the ICCP working group

- Proposed by Angeles Borrego 2008 Oviedo
- DOMVR survey 2009 Gramado, ICCP News No. 48
- ASTM standard D7708 in 2011 ASTM Standards

Designation: D7708 – 11

Standard Test Method for
Microscopical Determination of the Reflectance of Vitrinite Dispersed in Sedimentary Rocks[1]



Oviedo 2008 *Gramado 2009* *Belgrade 2010* *Porto 2011*

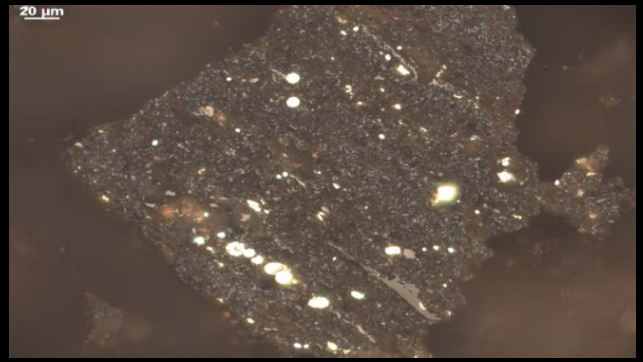
Identification of primary vitrinite: History of the working group cont.

- ASTM D7708 interlaboratory study in 2012-2013
- Results presented Sosnowiec 2013
- Results presented AAPG, Houston, USA, 2014
- Results published in J. Marine and Petroleum Geology, 2015

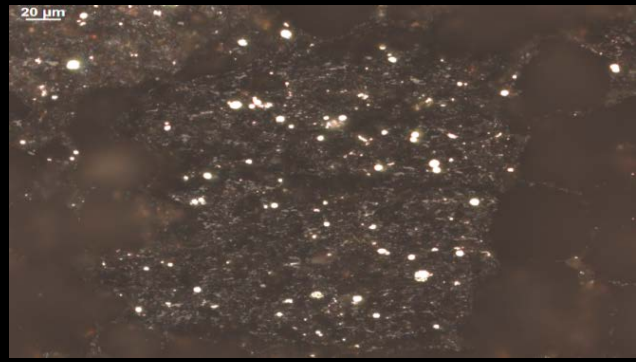
2015-2016 Interlaboratory Study

- Six high maturity samples with high TOC – current USA shale gas/tight oil plays: e.g., Eagle Ford, Marcellus, Haynesville, Barnett, Bakken, Woodford

Jurassic:TOC 2.66 wt.%, Ro > 1.0%



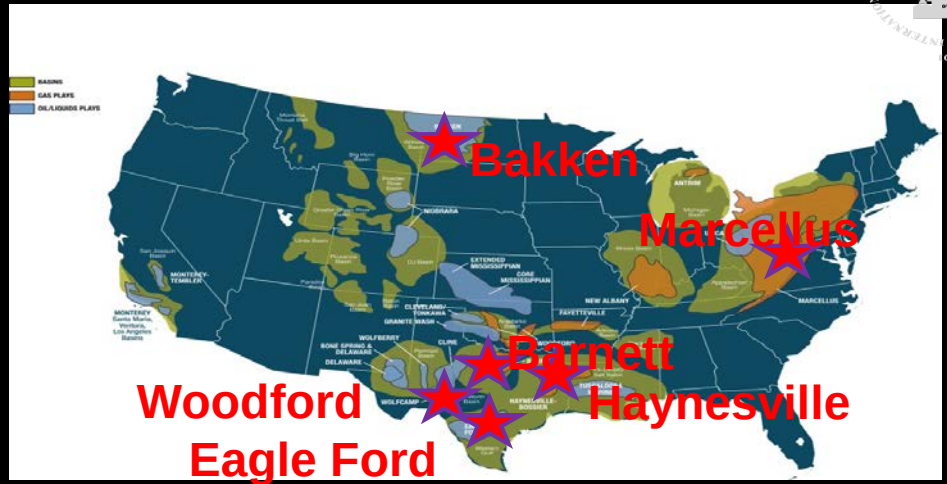
Upper Cretaceous: TOC 5.07 wt.%, Ro > 1.0%

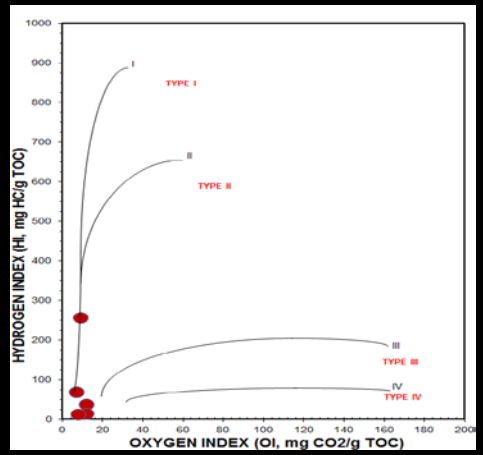


Devonian: TOC 5.17 wt.%, Ro > 1.0%

Samples:

- From core
- High maturity: peak oil, condensate/wet gas, dry gas
- Organic-rich (2.7-11.5% TOC)
- From North America
- 6 shale gas and tight oil plays with ‘name recognition’
- Typical of the shale
- Vitrinite is rare!
- Distributed as crushed rock
- Instructions to follow D7708

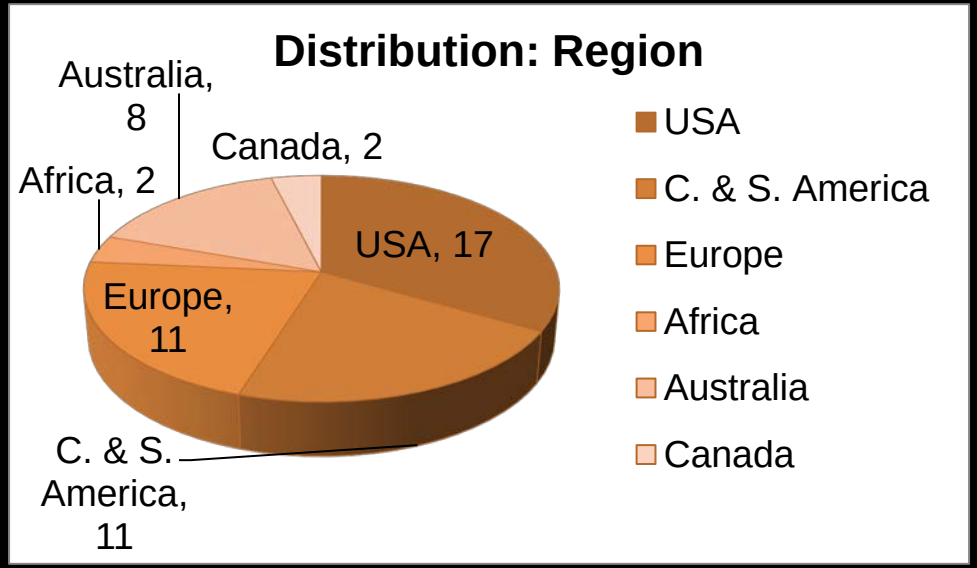




Distribution of Samples

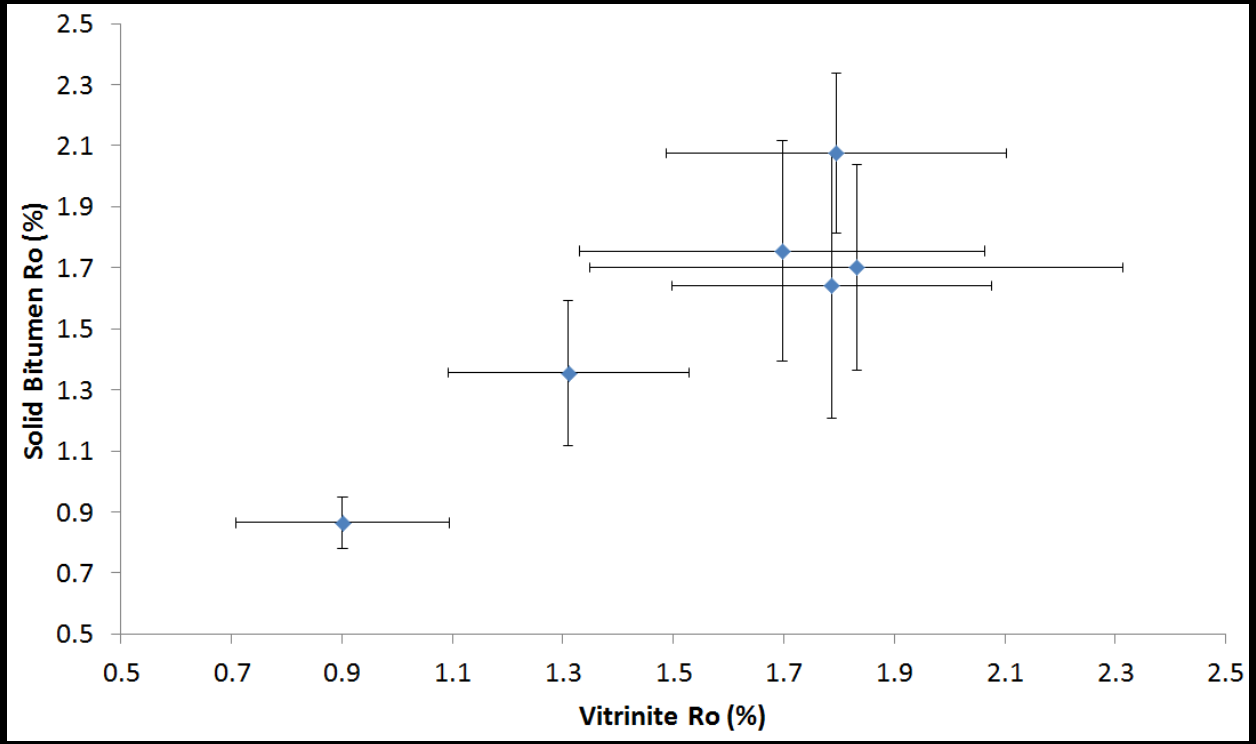
- Samples posted January 2016

- 51 Petrographers
- 40 Laboratories
- 14 Countries
- 6 Continents

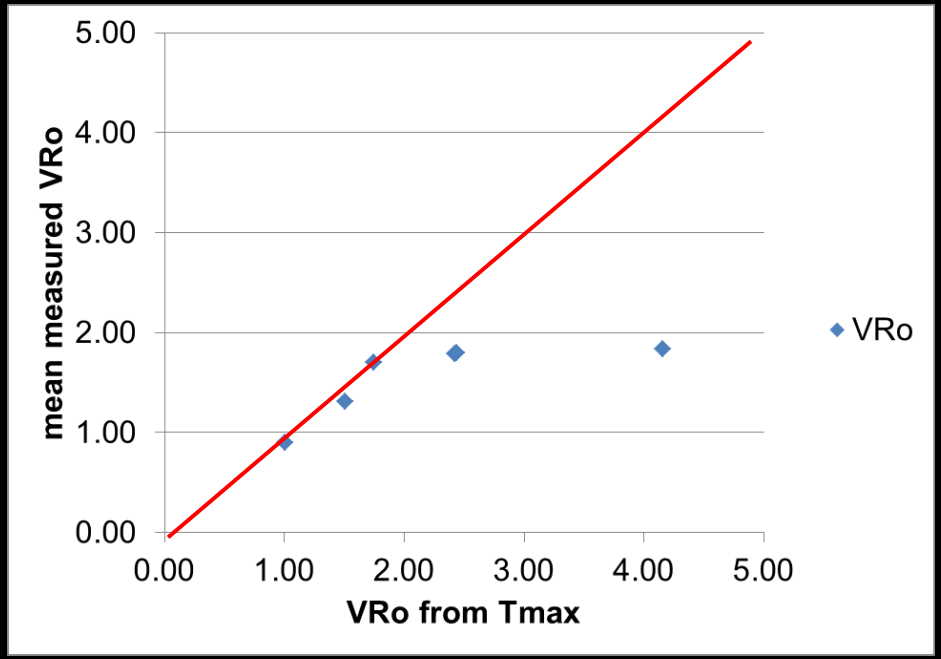


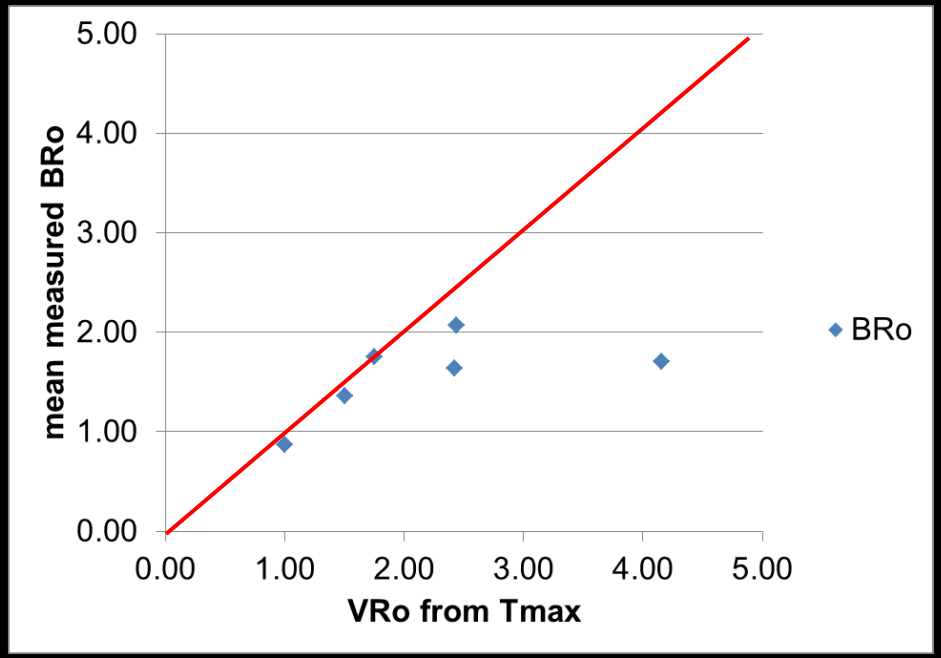
Results: from 36 petrographers

- High standard deviations
- Reproducibility is very poor
- Results need to be refined by some method



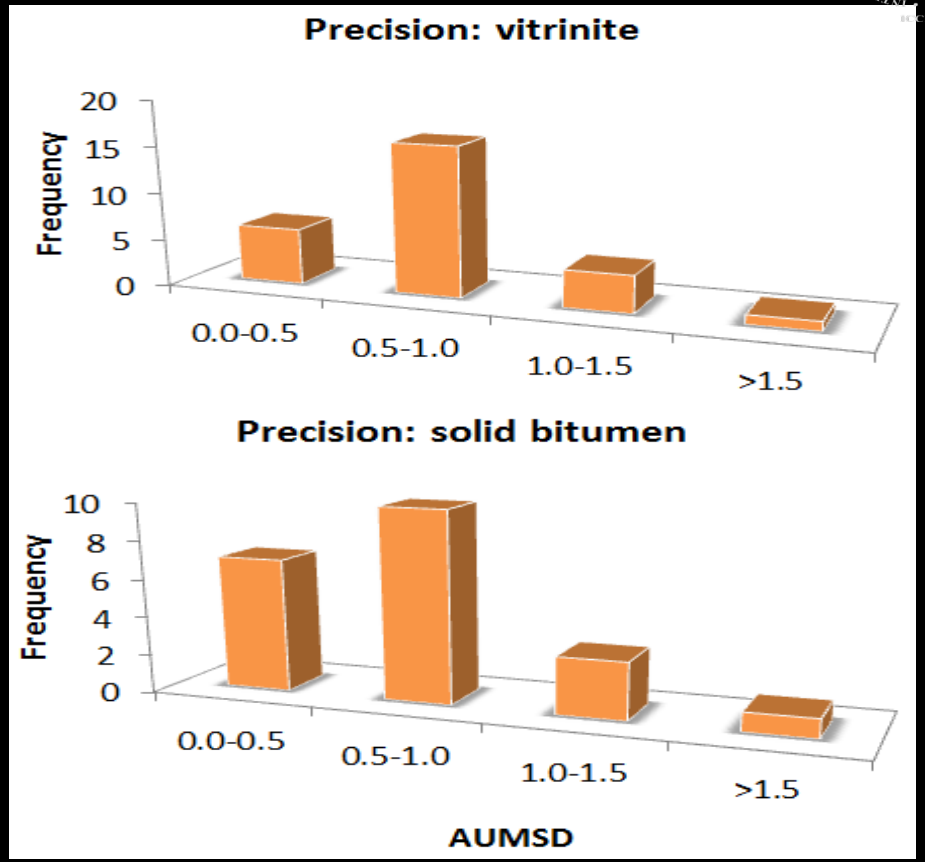
Results: from 36 petrographers



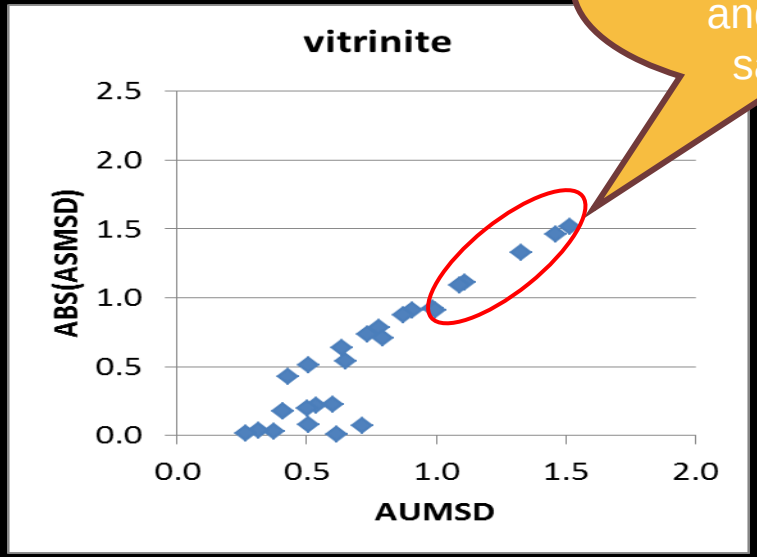


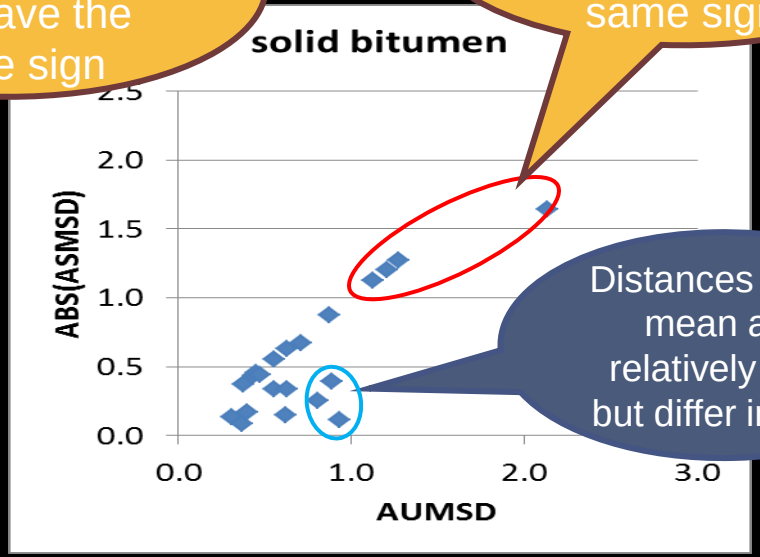
Results

- 36 petrographers up until September 9th, 2016
- 71% (36 of 51) sample recipients returned results
- 28 petrographers held ICCP accreditation in DOMVR
- Accredited vs. non-accredited petrographers performed similarly
- 1 petrographer had AUMSD >1.5 for vitrinite
- 1 petrographer (a different one) had AUMSD >1.5 for solid bitumen
- Most had moderate to high precision (because of high group s.d.)



Results: Precision vs. Bias





- Calibration difficulties for high ABS(ASMSD) (?)
- Identification difficulties for high AUMSD and low ABS(ASMSD) (?)

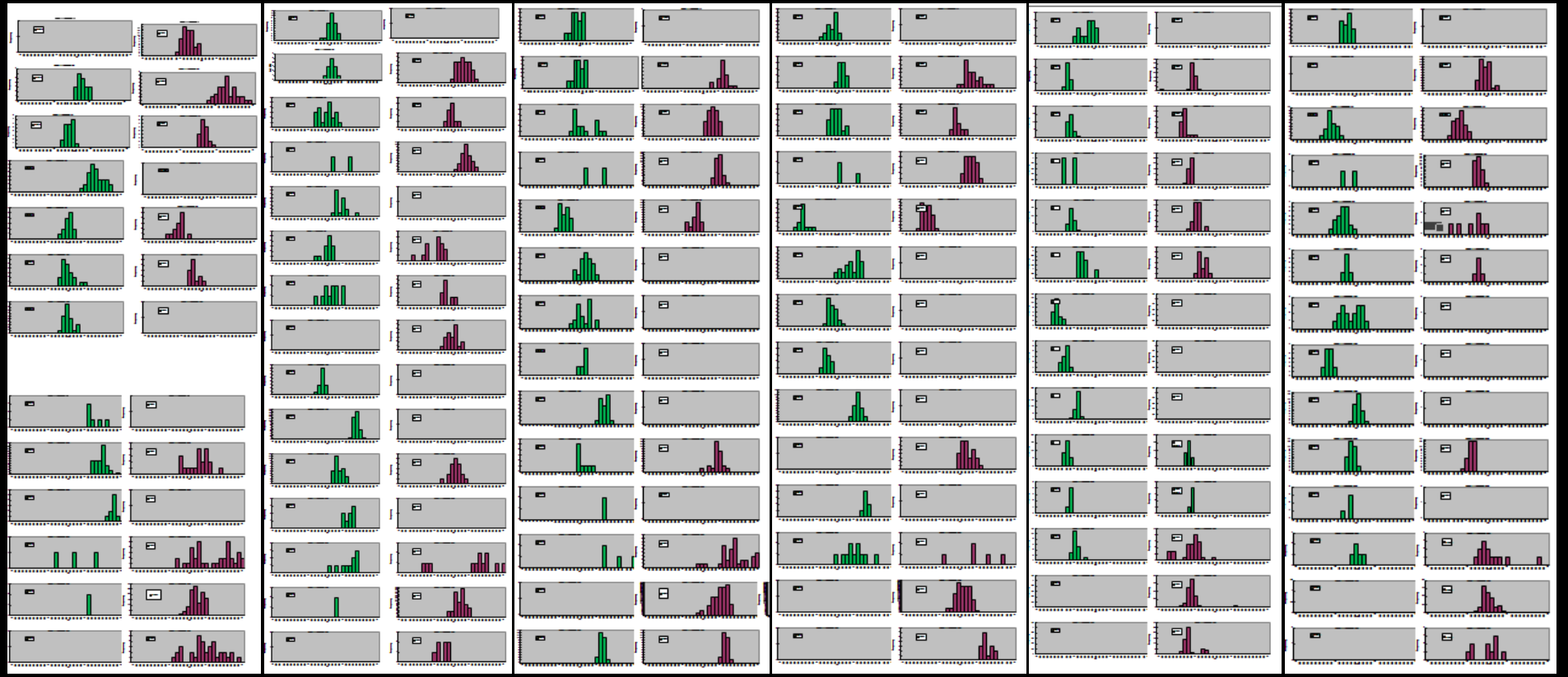
Summary

- The results were terrible
- Some statistical method must be used to eliminate outliers
- These results cannot be published, in my opinion
- Solid bitumen vs vitrinite identifications continue to plague organic petrography of NA shales
- These samples were representative of NA shales, and high TOC
- If we cannot measure them, what are we doing?

How to refine results and publish?

- Some objective statistical method or approach must be used to eliminate outliers
- Throw out SMSD and USMD >1.0? (5-8)
- Throw out results non-compliant to D7708? (Many!)
- A criterion to limit standard deviation? 0.15*Ro
- A photographic round robin to see what people identify as vitrinite?
- Other suggestions?

1 2 3 4 5 6



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Acknowledgments

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