

# Morgan Elizabeth Gallagher

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## Ph.D. Candidate

Department of Earth Science  
Rice University MS-126  
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## Research Interests:

- ❖ The carbon cycle, climate change, carbon sequestration, biofuels research

## Education:

- ❖ Ph.D. 2004-2009\* *Biogeochemistry*  
Department of Earth Science  
Rice University, Houston, TX, USA  
Advisor: Dr. Caroline Masiello  
\*Anticipated graduation May 2009
- ❖ B.Sc. 2000-2004 *Atmospheric Science*  
Department of Atmospheric Sciences  
Texas A&M University, College Station, TX USA  
Minors: Earth Science & Mathematics  
University, Foundation & Cum Laude Honors

## Work and Research Experience:

- ❖ 2004-present *Research Assistant to Caroline Masiello*  
Department of Earth Science, Rice University  
Houston, TX, USA  
Performed research using calorimetry and elemental analysis to measure changes in ecosystem carbon oxidation state and determine the mechanisms that drive these changes
- ❖ 2003-2004 *Student Assistant to Dr. Jean Ann Bowman*  
Texas Engineering Research Center, Texas A&M University  
College Station, TX, USA  
Gathered & analyzed data and assisted with proposal submissions
- ❖ 2002-2003 *Student Grader for Calculus I and Differential Equations*  
Department of Mathematics, Texas A&M University  
College Station, TX, USA  
Evaluated student performances and delegated grades

## Publications:

- ❖ Masiello, C.A., **M.E. Gallagher**, J.T. Randerson, R.M. Deco, O.A. Chadwick. "Measuring the carbon oxidation state of the Earth's terrestrial biosphere." In Submission to Journal of Geophysical Research-Biogeoscience.

**Scientific Presentations:**

- ❖ 2006 *Poster Presentation*  
 “The Effects of Decomposition on the Oxidative Ratio and Carbon Oxidation State of Organic Matter”  
 American Geophysical Union Fall Meeting  
**M.E. Gallagher**, N. Clark, C.A. Masiello, J.T. Randerson, and G.P. Robertson
- ❖ 2005 *Poster Presentation*  
 “Accuracy and Precision in Measurements of Biomass Oxidative Ratios”  
 American Geophysical Union Fall Meeting  
**M.E. Gallagher**, C.A. Masiello, J.T. Randerson, O.A. Chadwick, and R.M. Deco

**Teaching Experience:**

- ❖ Summer 2006 Mentor to an Undergraduate in Rice’s Alliances for Graduate Education and the Professoriate (AGEP) Program
- ❖ Spring 2006 ESCI 102 Evolution of the Earth – Teaching Assistant

**Field Work:**

- ❖ *Kellogg Biological Station Long Term Ecological Research, Kalamazoo, MI, USA*
  - ◇ 2007 Designed and deployed litter bag experiment to measure the oxidative ratio associated with a land use changes from grassland, successional, deciduous, and coniferous forests to agriculture
  - ◇ 2005 Designed and deployed litter bag experiment to measure the oxidative ratio due to respiration in an agricultural ecosystem
  - ◇ 2005 Sampled archived biomass for land use time-series of C<sub>ox</sub>
- ❖ *Grassland, Water, and Soil Research Laboratory USDA ARS, Temple, TX, USA*
  - ◇ 2007 Sampled archived biomass from the CO<sub>2</sub> Tunnel Experiment performed in 2000

**Service – Journal Review:**

- ❖ Biogeochemistry
- ❖ Environmental Science & Technology
- ❖ Soil Biology & Biochemistry

**Service - Internal:**

- ❖ 2007-2008 *GeoUnion President*  
(Department of Earth Science Graduate Student Organization)
- ❖ 2006 – 2007 *GeoUnion Treasurer*  
*Rice University Recruitment* at the Geological Society of America 2006 Annual Meeting
- ❖ 2005 – 2006 *American Association of Petroleum Geologists Student Chapter Treasurer*

*Rice University Recruitment at the Geological Society of America 2005 Annual Meeting and the American Geophysical Union 2005 Fall Meeting*

❖ 2003 – 2004

*Texas A&M Student Chapter of the American Meteorological Society Vice-President*

❖ 2002 – 2003

*Texas A&M Student Chapter of the American Meteorological Society Secretary*

***Professional Societies:***

- ❖ American Association of Petroleum Geologists
- ❖ Geological Society of America

- ❖ American Geophysical Union
- ❖ American Meteorological Society

***Honors & Awards:***

❖ 2006

*AGU Outstanding Student Paper Award - Biogeosciences*  
2006 American Geophysical Union Fall Meeting  
Poster Presentation: “The Effects of Decomposition on the Oxidative Ratio and Carbon Oxidation State of Organic Matter”

**M.E. Gallagher**, N. Clark, C.A. Masiello, J.T. Randerson, and G.P. Robertson

❖ 2000-2004

*Alliance Scholarship*

Shell & Texaco Alliance Companies: Equiva, Motiva & Equilon

❖ 2003-2004

*AMS Student Chapter of the Year (Vice-President)*

❖ 2001-2002, 2003-2004

*Academic Incentive Scholarship*

Honors Program, Texas A&M University

❖ 2003

*Mendon B Krischer Memorial Scholarship*

Texas A&M University

❖ 2002

*Distinguished Student*

Texas A&M University

❖ 2002

*Gathright Scholar Award*

Association of Former Students & Student Government

Association, Texas A&M University

❖ 2000-2002

*Geosciences and Earth Resources Fund*

Department of Atmospheric Sciences, Texas A&M University

***Practical and Analytical Proficiency:***

- |                                       |                    |
|---------------------------------------|--------------------|
| ❖ Parr 6200 Calorimeter               | ❖ Matlab           |
| ❖ Costech Elemental Combustion System | ❖ SAS              |
| ❖ C++                                 | ❖ ERDAS Imagine    |
| ❖ Fortran                             | ❖ Microsoft Office |
| ❖ IDL                                 |                    |

***Research Summary:***

My research focuses on using calorimetry, elemental analysis, and  $^{13}\text{C}$  nuclear magnetic resonance spectroscopy to measure changes in ecosystem carbon oxidation states ( $\text{C}_{\text{ox}}$ ) and determine the mechanisms that cause these changes. These mechanisms are dominated by variations in plant growth in response to changes in their environment. Changes in species composition of an ecosystem, biomass allocation of plants (i.e. between roots, leaves, and stems), or organic compound biosynthesis (i.e. the types of compounds that plants produce – carbohydrates, lignin, lipids, and proteins) are possible mechanisms that can cause shifts in ecosystem  $\text{C}_{\text{ox}}$ . These mechanisms can be triggered by different environmental drivers. The environmental drivers that I study include changes in atmospheric carbon dioxide levels, nutrient supply (e.g. nitrogen), and climate.

Ecosystem  $\text{C}_{\text{ox}}$  is linearly related to ecosystem oxidative ratios (OR), which is defined as the moles of  $\text{O}_2$  released per mole of  $\text{CO}_2$  fixed during photosynthesis. OR is a critical parameter used in anthropogenic  $\text{CO}_2$  apportionment calculations. Therefore, a better estimation and understanding of OR can help to further constrain the sizes of the terrestrial biosphere and ocean carbon sinks.