

*Department of*  
***Atmospheric and  
Oceanic Sciences***  
**Seminar**  
**AOS270**

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**“Recent Increase in Ocean Carbon Uptake Driven by  
Weaker Overturning Circulation”**

**ABSTRACT:**

The ocean is the largest sink for anthropogenic CO<sub>2</sub>, having absorbed roughly 40% of anthropogenic CO<sub>2</sub> since the beginning of the industrial era. Recent data show that the oceanic CO<sub>2</sub> sink has intensified over the past decade, reversing a trend of stagnant or negative growth in CO<sub>2</sub> uptake during the 1990s. Here we show that ocean circulation variability is the primary driver of these changes. We used a global inverse model to quantify the mean ocean circulation during the 1980s, 1990s, and 2000s, and then estimated the impact of decadal circulation changes on the oceanic CO<sub>2</sub> sink using a prognostic carbon cycling model. We find that during the 1990s an enhanced overturning circulation drove increased outgassing of natural CO<sub>2</sub>, thus weakening the global CO<sub>2</sub> sink. This trend has reversed during the 2000s as the global overturning circulation weakened. Continued stratification-driven weakening of the overturning is likely to strengthen the CO<sub>2</sub> sink in the near-term by trapping natural CO<sub>2</sub> in the deep ocean, but ultimately weaker overturning may limit oceanic uptake of anthropogenic CO<sub>2</sub>.

**Wednesday, October 19, 2016**  
**3:30 PM to 4:30PM**  
**MS 7124**