# Sediment Geochemistry (OCN/GG 644)  
**Course Outline -- Spring 2015**

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Lecture #</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-Jan</td>
<td>M</td>
<td>1</td>
<td>Introduction, discussion of course structure and topics to be covered</td>
</tr>
<tr>
<td>14-Jan</td>
<td>W</td>
<td>2</td>
<td>Components and Distribution of Marine Sediment Types</td>
</tr>
<tr>
<td>19-Jan</td>
<td>M</td>
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<td>Holiday: MLK Day</td>
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<tr>
<td>21-Jan</td>
<td>W</td>
<td>3</td>
<td>Physical Properties of Sediments, Sediment Accumulation Rates and Sediment Transport Processes</td>
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<tr>
<td>26-Jan</td>
<td>M</td>
<td>4</td>
<td>Physical Properties of Sediments, Sediment Accumulation Rates and Sediment Transport Processes</td>
</tr>
<tr>
<td>28-Jan</td>
<td>W</td>
<td>5</td>
<td>Diagenetic Chemical Processes I: Equilibrium &amp; Homogeneous Rxns (Keq &amp; intro dxn of radioactive decay eqn.)</td>
</tr>
<tr>
<td>2-Feb</td>
<td>M</td>
<td>6</td>
<td>Isotope Geochemistry</td>
</tr>
<tr>
<td>4-Feb</td>
<td>W</td>
<td>7</td>
<td>Diagenetic Chemical Processes II: Precipitation, Dissolution, and Authigenic Processes</td>
</tr>
<tr>
<td>9-Feb</td>
<td>M</td>
<td>8</td>
<td>Diagenetic Chemical Processes III: Solutions to Diagenetic Equations</td>
</tr>
<tr>
<td>11-Feb</td>
<td>W</td>
<td>9</td>
<td>Biogeochemical Processes in Sediments: Bacterial Respiration and Redox Zonation in Sediments</td>
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<tr>
<td>16-Feb</td>
<td>M</td>
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<td>Holiday: Presidents Day</td>
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<tr>
<td>18-Feb</td>
<td>W</td>
<td>10</td>
<td>Organic matter reactivity and preservation-A: sources and source signals (C:N:P, d13C, van Krevelen diagrams, lignin)</td>
</tr>
<tr>
<td>23-Feb</td>
<td>M</td>
<td>11</td>
<td>Organic matter reactivity and preservation-B: redox state and sediment accumulation rate</td>
</tr>
<tr>
<td>25-Feb</td>
<td>W</td>
<td>12</td>
<td>Organic matter reactivity and preservation-C: OC:SA, O2-Exposure time</td>
</tr>
<tr>
<td>2-Mar</td>
<td>M</td>
<td>13</td>
<td>mini-lecture #1: OC Burial in Marine Sediments: Productivity or Preservation?</td>
</tr>
<tr>
<td>4-Mar</td>
<td>W</td>
<td>14</td>
<td>mini-lecture #2: Hierarchy of oxidants in sediments: Departures from the Classical Sequence</td>
</tr>
<tr>
<td>9-Mar</td>
<td>M</td>
<td>15</td>
<td>Mid-term Exam</td>
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<tr>
<td>11-Mar</td>
<td>W</td>
<td>16</td>
<td>Quantifying Carbon and Nutrient Remineralization in Sediments</td>
</tr>
<tr>
<td>16-Mar</td>
<td>M</td>
<td>17</td>
<td>An Introduction to the Organic Geochemistry of Marine Sediments</td>
</tr>
<tr>
<td>18-Mar</td>
<td>W</td>
<td>18</td>
<td>Dissolved Organic Matter in Marine Sediments</td>
</tr>
<tr>
<td>23-Mar</td>
<td>M</td>
<td>19</td>
<td>Linking Sediment Organic Geochemistry and Sediment Diagenesis</td>
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<tr>
<td>25-Mar</td>
<td>W</td>
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<td>Spring Recess</td>
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<tr>
<td>30-Mar</td>
<td>M</td>
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<td>Spring Recess</td>
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<tr>
<td>1-Apr</td>
<td>W</td>
<td>20</td>
<td>Processes at the Sediment-Water Interface</td>
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<tr>
<td>6-Apr</td>
<td>M</td>
<td>21</td>
<td>Nonsteady-State Processes in Marine Sediments</td>
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<tr>
<td>8-Apr</td>
<td>W</td>
<td>22</td>
<td>Biogeochemical Processes in Pelagic (Deep-Sea) Sediments</td>
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<tr>
<td>13-Apr</td>
<td>M</td>
<td>23</td>
<td>Biogeochemical Processes in Continental Margin Sediments</td>
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<tr>
<td>15-Apr</td>
<td>W</td>
<td>24</td>
<td>Biogeochemical Processes in Continental Margin Sediments</td>
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<tr>
<td>20-Apr</td>
<td>M</td>
<td>25</td>
<td>mini-lecture #3: TBA</td>
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<tr>
<td>22-Apr</td>
<td>W</td>
<td>26</td>
<td>mini-lecture #4: TBA</td>
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<tr>
<td>27-Apr</td>
<td>M</td>
<td>27</td>
<td>Deltaic Sediments: Case Studies (fluidized bed reactor; reverse weathering); Fe-biogeochemistry, Redox Oscillations</td>
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<tr>
<td>29-Apr</td>
<td>W</td>
<td>28</td>
<td>Permeable Sediments; Benthic Photosynthesis (C-fix'n, pH, O2); Gas Hydrates</td>
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<tr>
<td>4-May</td>
<td>M</td>
<td>29</td>
<td>Ocean Acidification and Benthic Carbonate Dissolution</td>
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<tr>
<td>6-May</td>
<td>W</td>
<td>30</td>
<td>The Role of Sediment Diagenesis in Coupled C-N-P-O Global Cycles</td>
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<td>11-May</td>
<td>M</td>
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<td>FINAL EXAM: 9:45 to 11:45 a.m.</td>
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Class: Monday & Wednesday, 10:30 - 11:45 pm, MSB 315

Instructor: Kathleen Ruttenberg

Office Hours: Wednesdays 1:00-2:00, or by appointment, MSB 222, 956-9371, kcr@soest.hawaii.edu

Required Readings: Text: Geochemistry of Marine Sediments, David J. Burdige, 2006; scientific journal articles, TBA

Final grade = mid-term exam (25%); final exam (30%); homework or in-class assignments (25%); class participation (20%)

OCN/GG 644 SLOs: Upon successful completion of the course, students are expected to be able to:

1) describe the nature and distribution of sediments in the worlds' oceans, identify sediment sources and biogeochemical characteristics
2) specify the various diagenetic processes that occur in marine sediments, and understand how to quantify these processes
3) understand the major areas in which our knowledge about sediment geochemical processes is incomplete, and new methods and approaches that are being brought to bear to expand our ability to describe and quantify these processes
4) achieve a firm grasp on the role of sediment geochemistry in global element cycles
5) use written and oral communication to clearly explain sediment biogeochemical processes and related contemporary research