Earth Sciences Program Review
2006-2007 Academic Year

Part I: Preamble

Earth Sciences is a small department within the Physical Sciences Division. It currently offers three physical science lab classes that all transfer to UC and CSU to satisfy general education requirements in the physical sciences. It does not award any certificates or degrees. The three classes are Introductory Geology (GEOL 2/2L), Introductory Oceanography (OCEN 2), and Earth Disasters and Catastrophes (GEOL 8).

The mission of the Earth Science Department could easily be adapted from the MPC Mission Statement: It is the mission of Earth Science Department to offer stimulating, high-quality courses to our diverse community. It offers transferable Geology and Oceanography courses equivalent in content and rigor to lower division courses in four-year colleges and universities, for students who wish to pursue a Baccalaureate degree and for those who wish to continue their life-long learning.

Over the last four years, FTES has remained relatively constant, about 25 FTES per semester during fall and spring semesters, with an additional 5.8 FTES each summer semester. This enrollment has remained about 8% of the total Physical Sciences Division enrollment over the last four years.

We deliver the main thing students desire of our Department: fulfillment of the general education requirement of physical science lab classes. There have been no substantial areas of concern over the last four years.

Part II: Analysis

A. Curriculum Review

Curriculum forms for all Earth Science courses have all been revised and submitted for institutional review. For summary purposes, the course catalog description, the course schedule description, the course content, and the course objectives/exit standards are listed below for each class.

1a. GEOL 2 Introductory Geology

Catalog Description:

3 units • LG-C/NC • Three hours lecture;
This course introduces the physical processes that have shaped the earth through time. It emphasizes processes that determine internal structure and shape surficial features, such as plate tectonics, earthquakes, volcanism, and erosion. plate tectonics and erosional processes. The course emphasizes using the Scientific Method to investigate Earth history and processes.
Also offered in the Living Room Series.
Advisories: Elig for ENGL111/112 or ENSL110/155
Credit Transferable: CSU, UC

Schedule Description:

Corequisites: GEOL 2L Advisories: Elig for ENGL111/112 or ENSL110/155
Introduction to the physical processes that have shaped the earth through time, with emphasis on plate tectonics, earthquakes, volcanism, hydrology, and erosional processes. Emphasizes using the scientific method to interpret Earth history and processes.
LG-C/NC
Transfer:CSU, UC

Course Content:

1. Seafloor bathymetry, on-land topography, and plate tectonics
2. Mineralogy
3. Igneous Rocks
4. Volcanism
5. Sedimentary Rocks
6. Metamorphic Rocks
7. Erosion and Weathering
8. Geologic Time
9. Mass Wasting
10. Water—above and below the ground
11. Structural Geology
12. Earthquakes
13. Regional Geology

This class is technical in nature and does not discriminate among race, class or gender.

Course Objectives/Exit Standards:

The fundamental course objective or exit standard is for students to use the scientific method, their critical thinking skills, and the concepts presented in this class to solve Earth Science problems appropriate for an introductory Geology class. Examples of broad topics in which this is done follow. Students will demonstrate the ability to:

1. Recognize the major bathymetric and topographic features of the Earth and relate them to interactions between the Earth's major plates.
2. Identify the important rock-forming minerals.
3. Conceptualize how igneous, sedimentary, and metamorphic rocks form.
4. Identify various types of volcanoes and relate them to their tectonic setting and mode of eruption.
5. Identify the various types of sedimentary rocks and relate them to their depositional environment.
6. Identify various types of metamorphic rocks and relate them to their protoliths and to the conditions under which they may have been metamorphosed.
7. Interpret processes of erosion from inspection of photographs or images of geologic landscapes
8. Interpret a photograph, outcrop, or image of a group of rocks in terms of its geologic history from oldest event to youngest event.
9. Conceptualize geologic time.
9. Identify various kinds of landslides from and interpret the factors that may have caused them.
10. Identify kinds of rivers and relate their morphology to gradient, discharge, and sediment load.
11. Conceptualize groundwater flow through aquifers.
12. Interpret geologic structure from geologic maps.
13. Conceptualize the relationships between earthquakes, seismic waves, seismographs, and fault movement.
14. Interpret geologic history from geologic observations.

1b. GEOL 2L Introductory Geology Laboratory

Catalog Description:

1 unit • LG-C/NC • Three hours lab;
This course offers fundamental laboratory study and examination of the topics introduced in Geology 2. Local field trips are required.
Advisories: Elig for ENGL111/112 or ENSL110/155
Credit Transferable: CSU, UC

Schedule Description:

Corequisites: GEOL 2 Advisories: Elig for ENGL111/112 or ENSL110/155
Fundamental laboratory studies and examination of the topics introduced in GEOL 2. Local field trips required. LG-C/NC
Transfer:CSU, UC

Course Content:

1. Bathymetric and Topographic maps
2. Mineral Identification
3. Igneous Rock identification
4. Sedimentary Rock Identification
5. Metamorphic Rock Identification
6. Geologic Time and Geologic History
7. Mass Wasting
8. Water—above and below the ground
9. Structural Geology
10. Earthquakes
11. Regional Geology

This class is technical in nature and does not discriminate among race, class or gender.

Course Objectives/Exit Standards:

The fundamental course objective or exit standard is for students to use the scientific method, their critical thinking skills, and the concepts presented in this class to solve Earth Science problems appropriate for an introductory Geology Laboratory class. Examples of broad topics in which this is done follow. Students will demonstrate the ability to:
1. Interpret the major bathymetric and topographic features of the Earth and relate them in terms of plate tectonic interactions.
2. Recognize physical properties of minerals and use them to identify minerals.
3. Recognize mineral grain texture and composition in rocks and use them to identify rocks.
4. Interpret volcano shape in terms of eruption style and lava composition.
5. Interpret sedimentary rock composition in terms of depositional environment.
6. Use the texture and composition of rocks to interpret the processes that formed them.
7. Visualize and explain a three-dimensional surface from the information on a two-dimensional topographic contour map.
8. Interpret a photograph, outcrop, or image of a group of rocks in terms of its geologic history from oldest event to youngest event.
9. Conceptualize geologic time and explain the techniques used to measure it.
9. Estimate geologic hazards from topographic and geologic maps.
10. Recognize various types of rivers on topographic maps and complete basic tasks like measuring the gradient of rivers.
11. Interpret the direction of groundwater flow through aquifers.
12. Interpret geologic structure from geologic maps.
13. Estimate seismic hazards from topographic and geologic maps.
14. Interpret geologic history from geologic observations.

2. GEOL 8 Earth Catastrophes And Disasters

Catalog Description:

4 units • LG-C/NC • Three hours lecture; Three hours lab;
This course covers the application of basic principles of Earth processes, including tectonics, erosion, climate and wind to issues of catastrophic and disastrous events from a global perspective. Topics will include earthquakes, landslides, floods, severe weather, tsunamis, and volcanoes. Two weekend field trips are required.
Advisories: Elig for ENGL111/112 or ENSL110/155
Credit Transferable: CSU, UC

Schedule Description:

Advisories: Elig for ENGL111/112 or ENSL110/155
Application of basic principles of Earth processes, including tectonics, erosion, climate and wind to the issues of catastrophic and disastrous events from a global perspective. Topics include earthquakes, landslides, floods, severe weather, tsunamis, and volcanoes. Two weekend field trips required.
LG-C/NC
Transfer:CSU, UC

Course Content:

1. Earth materials – What is the Earth composed of?
   Learn to identify common rocks and minerals.
2. Topographic maps – What processes control the morphology of the Earth's surface?
   Practice using the topographic maps in lab.
3. Volcanoes and volcanic hazards
   Students use geologic maps and other data to assess the hazards associated with specific volcanoes and try to determine the likelihood of an eruption.
4. Earthquakes and seismology: Lecture on the effects of past earthquakes and what might happen to people during the next large earthquake.
5. Landslides and hill slope processes: Lecture on the effects of gravity pulling rock and soil down the hill.
6. River processes, flood plains, and flood recurrence intervals: Lecture on how to recognize flood plains and delineate them on maps.
7. The role of the oceans and atmospheric circulation in the formation of severe weather. Students map out water masses and air masses and determine how they interact with each other to produce severe weather events.

This class is technical in nature and does not discriminate among race, class or gender.

Course Objectives/Exit Standards:

The fundamental course objective or exit standard is for students to use the scientific method, their critical thinking skills, and the concepts presented in this class to solve oceanographic and Earth Science problems appropriate for an introductory Oceanography class. Examples of broad topics in which this is done follow. Students will demonstrate the ability to:

1. Recognize and identify a suite of common rocks and minerals.
2. Use basic geologic principles to identify the presence of geologic hazards at a given location.
3. Be able to read simple geologic maps and topographic maps.
4. Recognize, from topographic and geologic information, seismic hazards.
5. Understand the basic mitigation techniques for seismic hazards.
6. Recognize from topographic maps the flood plains of the major regional rivers.
7. Understand the basic mitigation technique for flood hazards.
8. Associate the kinds of volcanic hazards with specific kinds of volcanoes.
9. Identify appropriate mitigation techniques for volcanic hazards.
10. Predict and identify regions of rapid coastal erosion.
11. Discuss the factors that lead to the formation of severe weather events.

3. OCEN 2 Introductory Oceanography

Catalog Description:

4 units • LG-C/NC • Three hours lecture; Three hours lab;
This course introduces the geologic and physical processes that have influenced the oceans through time. It emphasizes processes that shape the seafloor and control the currents, tides, waves, and chemistry of the oceans. The course uses the Scientific Method to investigate ocean processes. Two weekend field trips may be required.
Credit Transferable: CSU, UC

Schedule Description:

Advisories: Elig for ENGL111/112 or ENSL110/155
The geologic and physical processes that influence the seafloor and the oceans. Includes plate tectonics, currents, tides, waves, chemical composition, and physics of the oceans. Two weekend field trips may be required.
LG-C/NC
Transfer:CSU, UC

Course Content:

1. Seafloor bathymetry and its relationship to plate tectonics
2. Kinds of sediments found on the seafloor
3. Patterns of seafloor sedimentation
4. Interpretation of ocean history from seafloor sediments
5. Chemistry of seawater, including salts, nutrients, and dissolved gasses
6. Physics of seawater, including heat capacity and the relationship between density, temperature, and salinity.
7. Deep water thermohaline circulation
8. Ocean – atmosphere interactions
9. Surface currents and upwelling
10. Relationship between biologic productivity and physical oceanography
10. Formation of waves
11. Formation of tides
12. Coastal processes

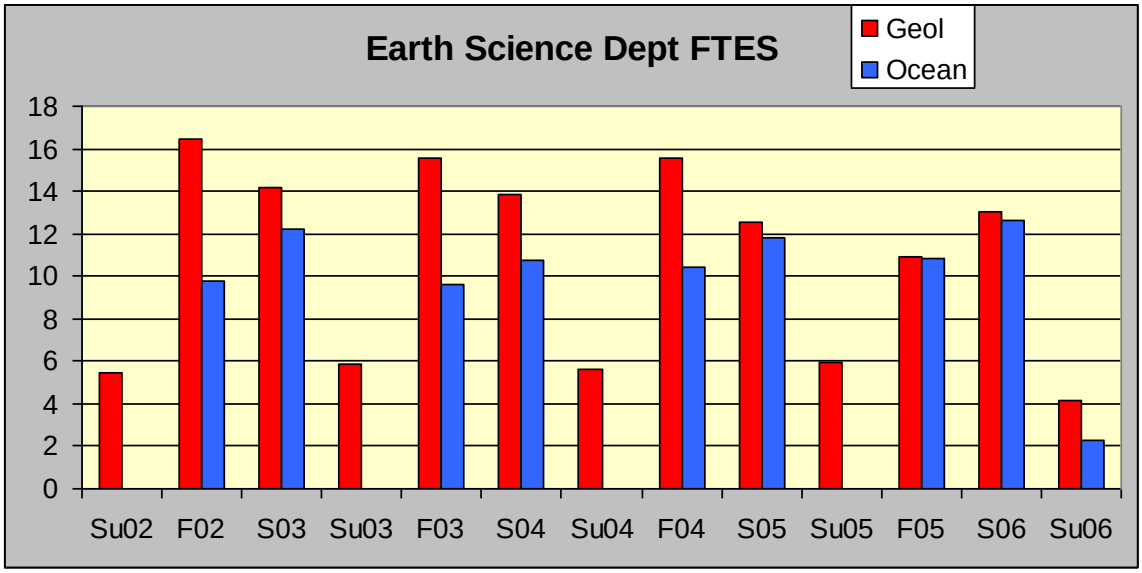
This class is technical in nature and does not discriminate among race, class or gender.

Course Objectives/Exit Standards:

The fundamental course objective or exit standard is for students to use the scientific method, their critical thinking skills, and the concepts presented in this class to solve oceanographic and Earth Science problems appropriate for an introductory Oceanography class. Examples of broad topics in which this is done follow. Students will demonstrate the ability to:
1. Interpret plate tectonic processes from seafloor bathymetry
2. Recognize the bathymetric, volcanic, and seismic features that distinguish each kind of plate tectonic boundary.
3. Describe location using latitude and longitude
4. Determine direction using oceanographic charts
5. Visualize and describe a three-dimensional surface from the information on a two-dimensional bathymetric contour map.
6. Use texture and composition to identify basic rock and sediment types found on the seafloor and in the marine environment
7. Relate sediments to depositional processes.
8. Predict changes in seawater density due to changes in salinity and/or temperature
9. Predict the movement of water bodies based on their density and prevailing wind directions
10. Predict regions of high biologic productivity based on water temperatures, currents, and winds
11. Conceptualize and describe wave shape from information such as wave period, frequency, land height.
12. Conceptualize factors causing the rise and fall of tides.
13. Summarize how tectonic and geologic factors influence coastal morphology

B. Program Information

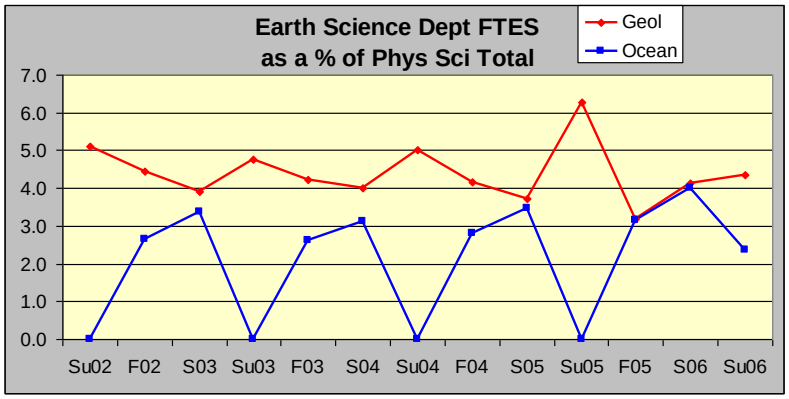
1. Quantifiable Factors



Earth Science FTES Trends. For each semester, Geology is on the left; Oceanography is on the right.

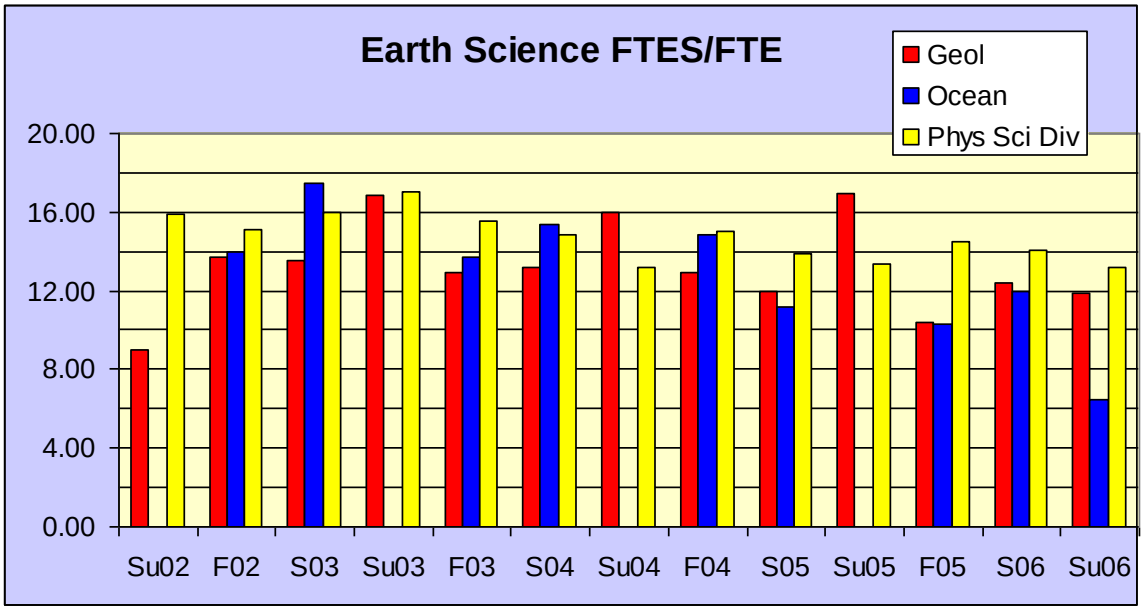
Over the last four academic years, the Geology classes have averaged 14 FTES in the fall and spring semesters and another 5.4 FTES in the summer semester. The Oceanography courses average 11 FTES per semester. FTES in the geology classes have declined about 8% per year over these four years, whereas FTES in the Oceanography classes have increased about 2% over the same time period. Earth Sciences total FTES has decreased 3% over the last four years. FTES in the Physical Sciences Division as a whole has decreased about 3.6% over this time period.

Enrollment in the geology class is usually higher in the Fall Semester whereas enrollment in the Oceanography class is usually higher in the Spring Semester. A summer Oceanography class was offered for the first time in the Summer '06 semester. Summer Oceanography courses will probably not be offered in the near future.



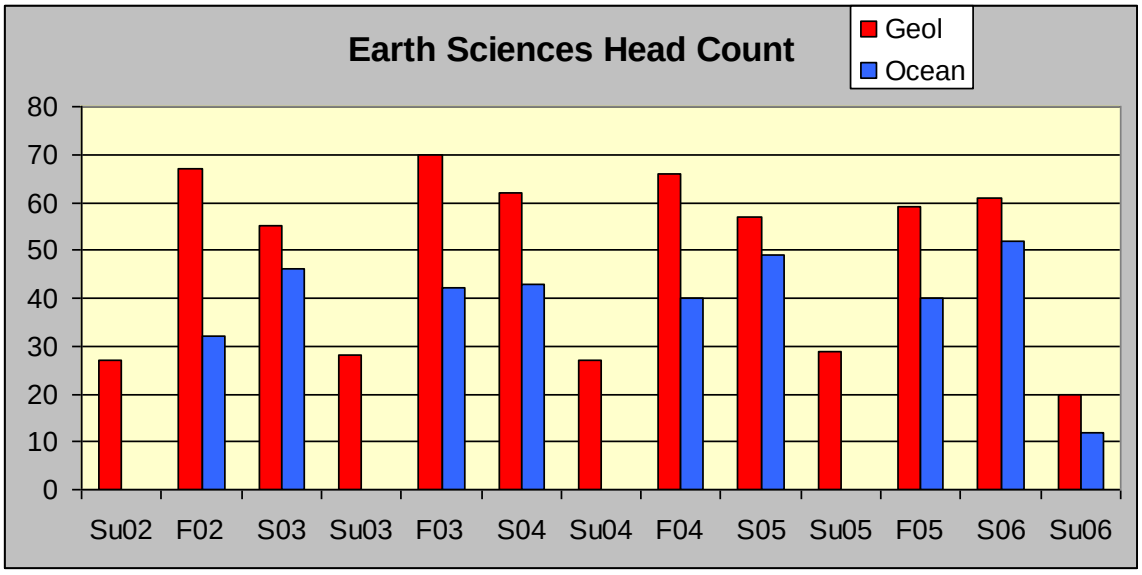
FTES as a percentage of Physical Science FTES. Geology is the upper line; Oceanography is the lower line.

As a percentage of all Physical Science classes, FTES in Earth Science courses have remained nearly constant. Geology represents about 4-5% of Physical Science FTES and Oceanography represents about 3-4% of Physical Science FTES.



Earth Science FTES/FTE. For each semester, Geology is on the left; Oceanography is in the center; Physical Science Division average is on the right.

The average Earth Science FTES/FTE is 13.8 whereas the average Physical Science Division FTES/FTE is 14.7. The low value for Oceanography in the Summer 2006 semester represents the first time we offered Oceanography in the summer; it was a small class.

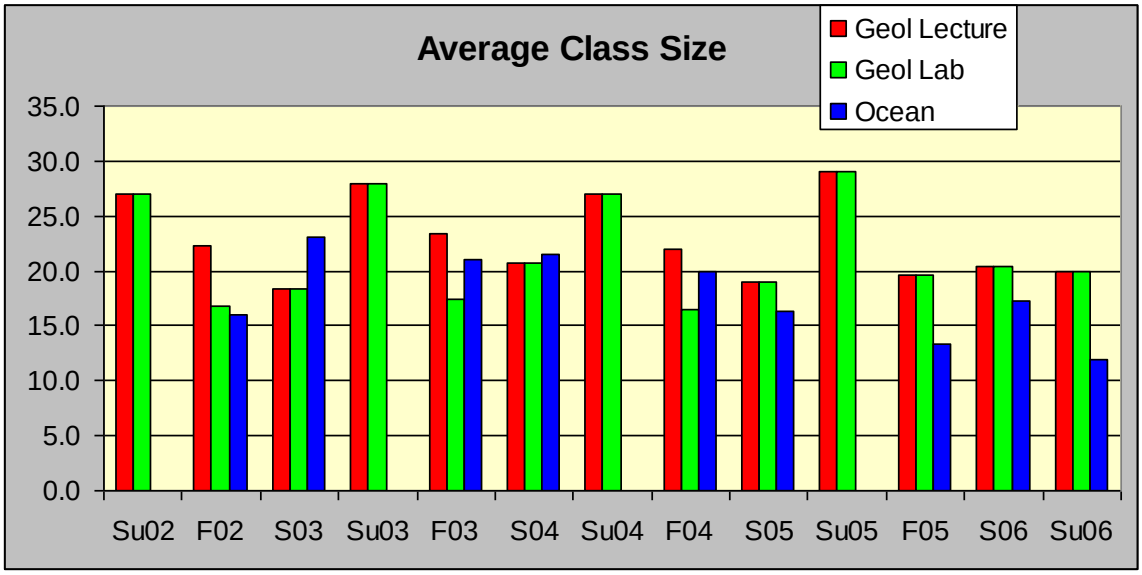


Total Enrollment for Earth Science classes by semester. Geology is on the left; Oceanography is on the right.

Total Enrollment numbers for Earth Sciences classes closely mirrors the Earth Science FTES trends.

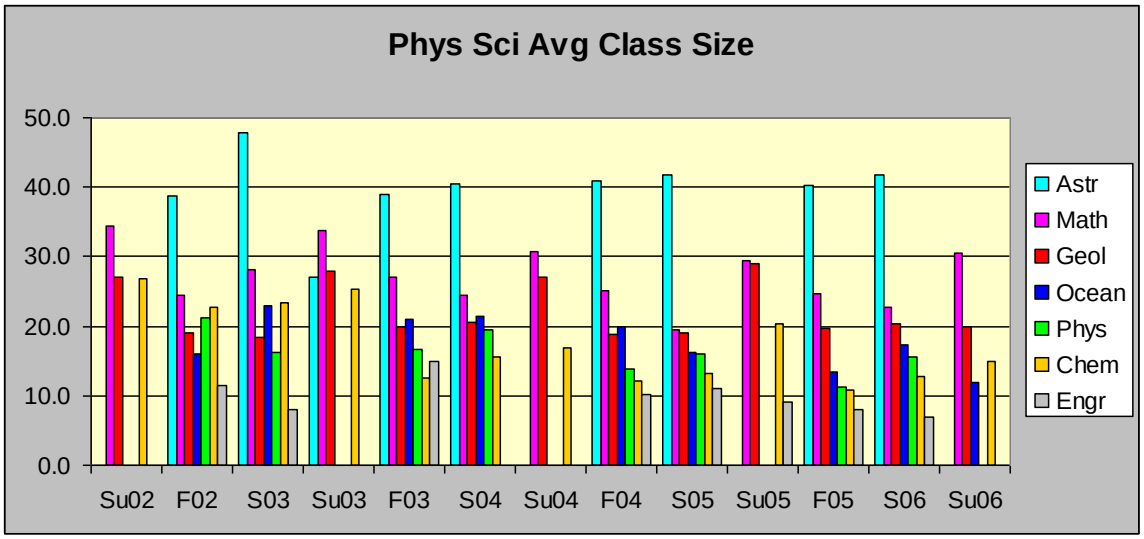
	Number of Sections for Earth Sciences Courses													
	Su02	F02	S03	Su03	F03	S04	Su04	F04	S05	Su05	F05	S06	Su06	AVG
GEOL2	1	3	3	1	3	3	1	3	3	1	3	3	1	2.4
GEOL2L	1	4	3	1	4	3	1	4	3	1	3	3	1	2.7
OCEN2	--	2	2	--	2	2	--	2	3	--	3	3	1	1.7

The number of sections offered by the Earth Sciences Department has remained relatively steady over the last four years. The only variation is the number of lab sections offered. The number of lab sections varies between 3 and 4 for Geology and between 2 and 3 for Oceanography.



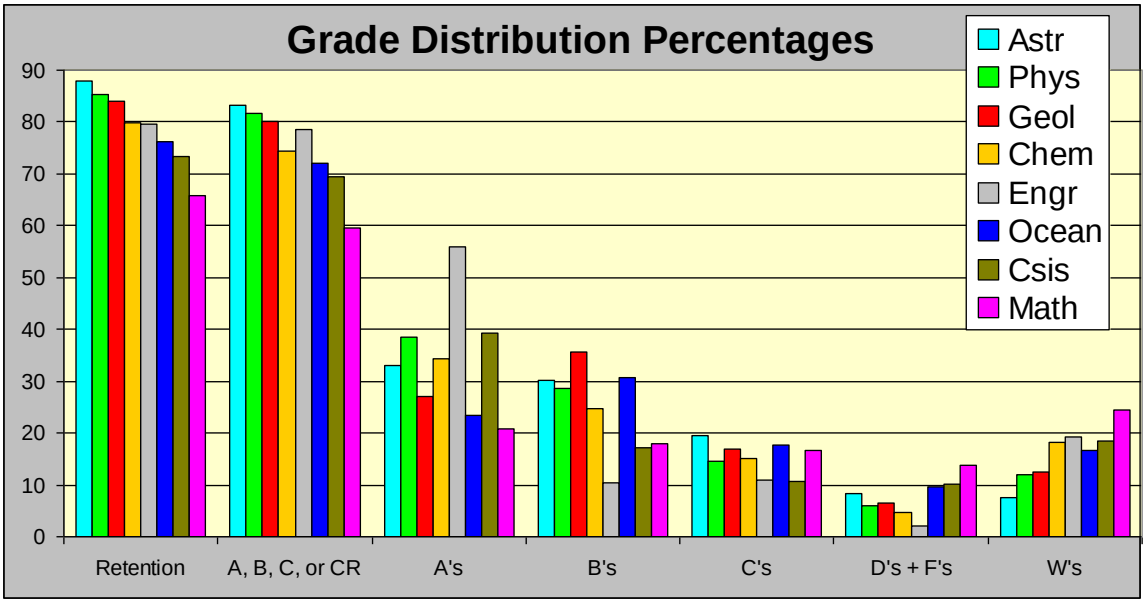
Average number of students in Earth Science classes. Geology lecture is on the left; geology lab is in the middle; Oceanography (includes lecture and lab) is on the right.

The average class size for geology classes is 24 students and the average class size for oceanography classes is 17 students. Average class size in the Physical Sciences Division is 27 students.



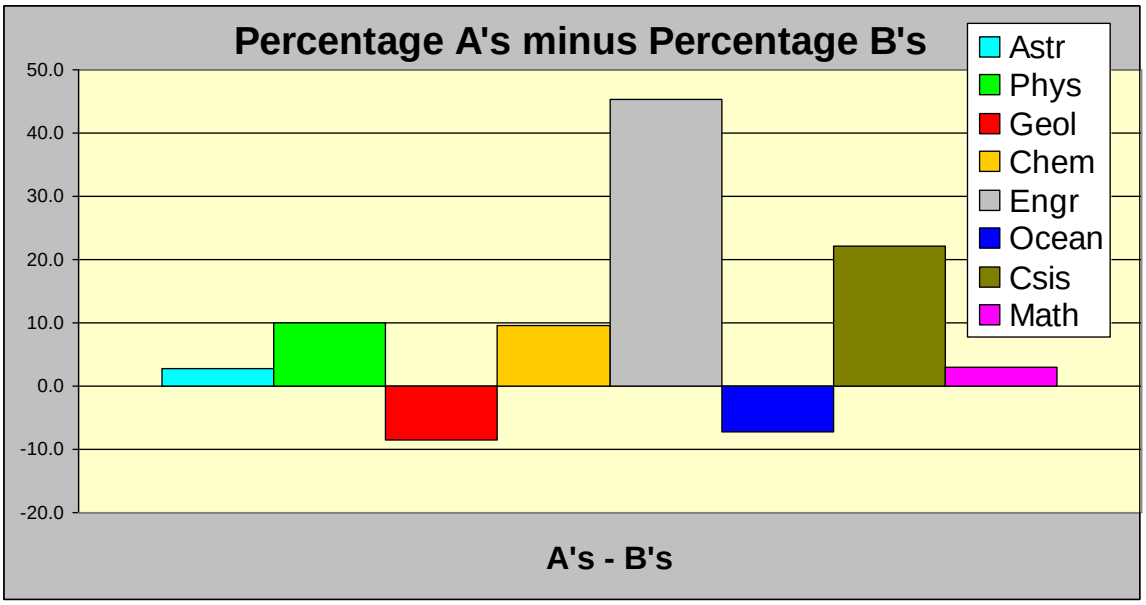
Average class sizes in the Physical Sciences Division. For each semester, the Physical Science departments are, from right to left, Astronomy, Math, Geology, Oceanography, Physics, Chemistry, and Engineering.

Earth Science classes in Geology and Oceanography usually represent the median in Physical Science Division average class size. Astronomy and Math class sizes are usually higher, while Physics, Chemistry, and Engineering class sizes are often lower.



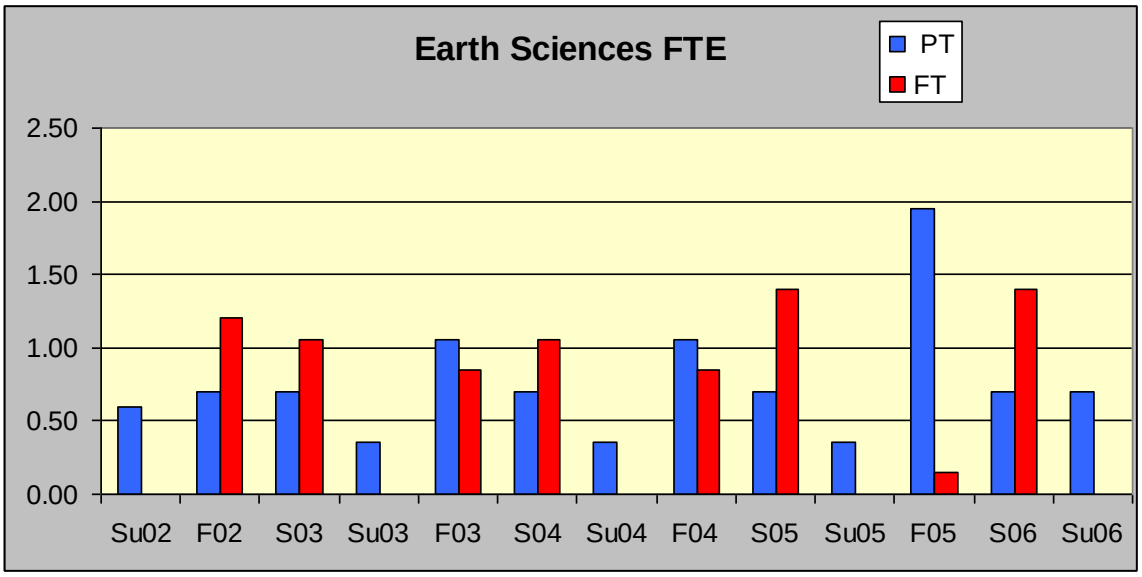
Grade Distribution, in terms of percentages, for all Physical Science departments. For each category, the bars represent, from left to right, Astronomy, Physics, Geology, Chemistry, Engineering, Oceanography, Computer Science, and Math.

Grades in Earth Sciences courses are near the median of all Physical Science departments in terms of Retention, passing grades (A, B, C, or CR), not passing grades (D's and F's), and W's. A notable difference between Earth Sciences courses and the rest of the Physical Science Departments is in the relative percentages of A's and B's awarded. For all Physical Sciences Departments, except Geology and Oceanography in the Earth Sciences Department, an A is the most common grade awarded. An A as the most common grade awarded in classes is evidence of grade inflation at MPC (and probably many other institutions as well).



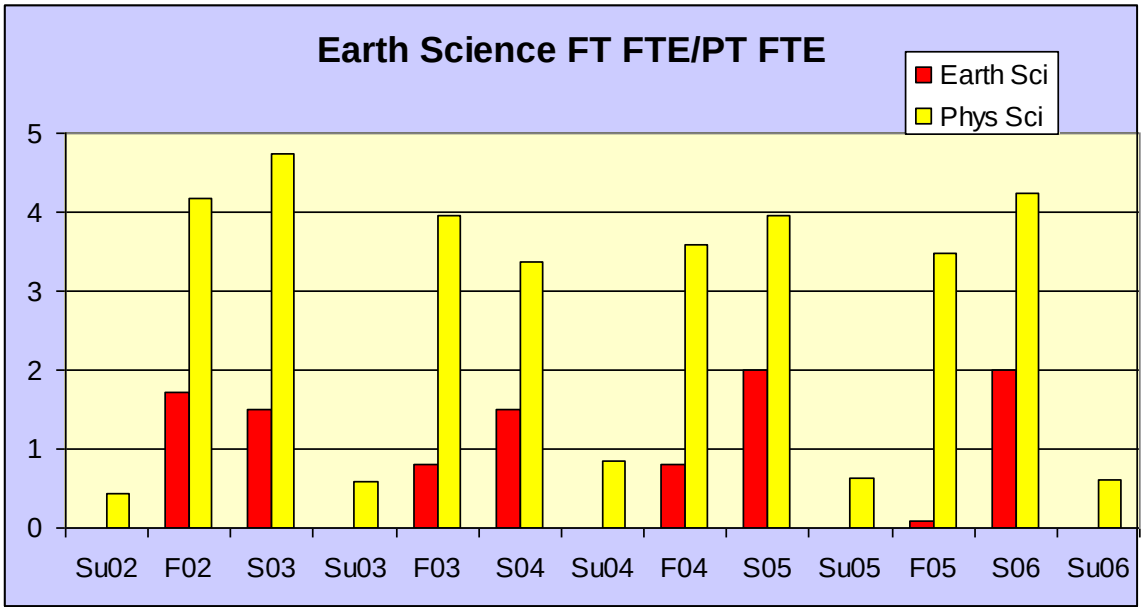
Percentage of A's minus the Percentage of B's. The bars represent, from left to right, Astronomy, Physics, Geology, Chemistry, Engineering, Oceanography, Computer Science, and Math. The two negative bars are Geology and Oceanography.

The graph above shows that most departments in the Physical Sciences Division award more A's than B's in their classes. The exception is the Geology and Oceanography classes in the Earth Sciences Department, in which B's were a more common grade than A's.



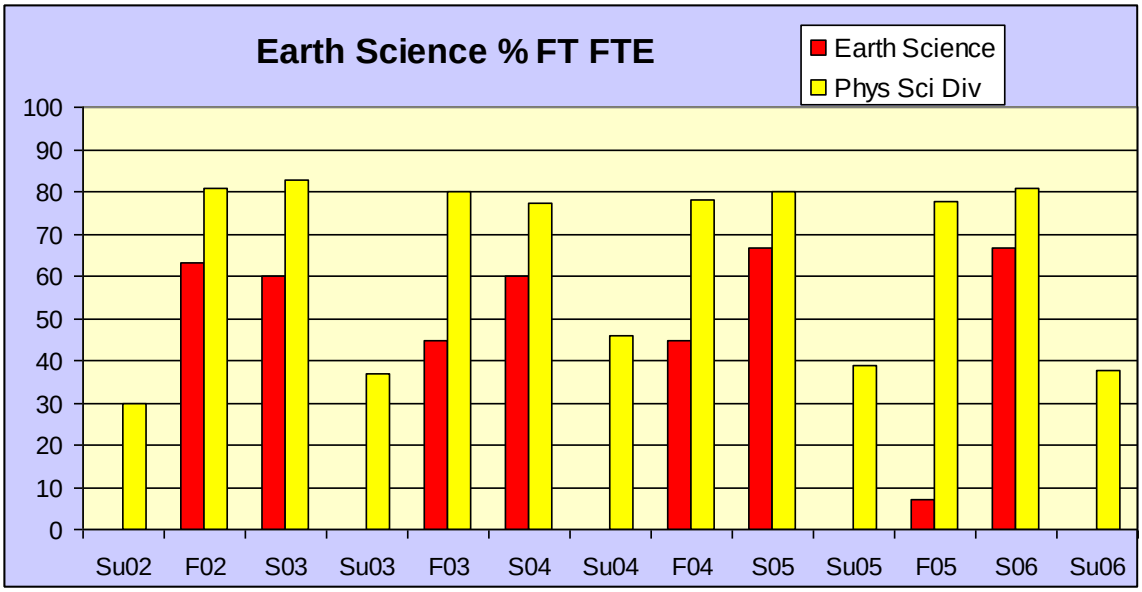
FTE distribution within the Earth Science Department. Part time (PT) is on the left and full time (FT) is on the right.

Key points on the FT/PT FTE distribution in the Earth Science Department are 1) no full time instruction during summer semesters, 2) full time is often less than one full FTE during fall semesters because the full time instructor often taught a MAST class during this semester. There is something wrong with the Fall 2005 data. The full time FTE should be more and the part time FTE should be less. It is a mistake somewhere in the data entry. The data also show that although part time instructors teach a significant proportion of Earth Science classes, addition of an additional full time instructor to the Earth Sciences Department is probably not justified at this time, especially with declining enrollment.



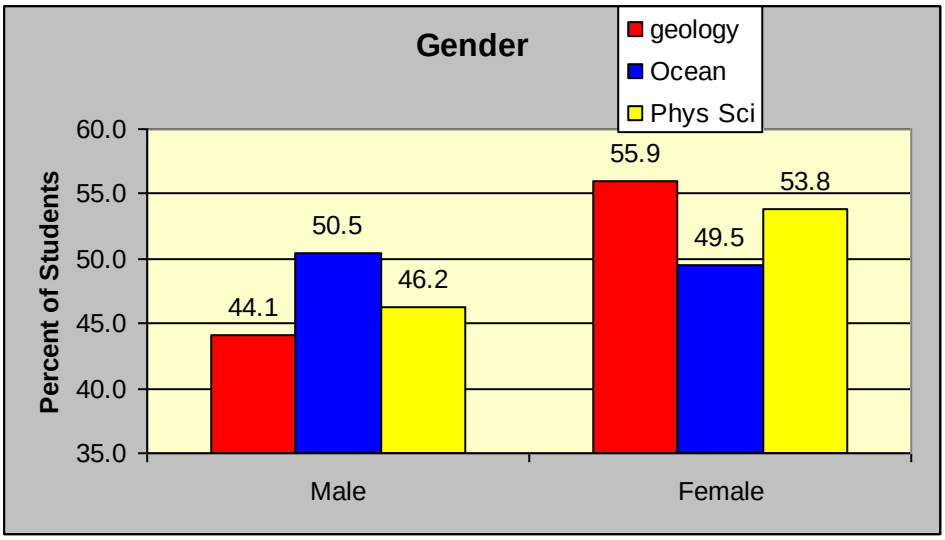
Ratio of full time (FT) to part time (PT) FTE. For each semester, Earth Science is on the left and the Physical Science Division is on the right.

The previous plot was requested in the Program Review outline. Because there are no full time instructors for any of the Earth Sciences summer offerings, the FTE FT/PT ratio is always zero for the summer semesters. The Fall semester ratios are lower because the full time Earth Science instructor often taught a MAST class during fall semesters. If you are actually reading this report, please contact me and I'll take you out for a beer. I am convinced there is something wrong with the Fall 05 data. Data for this semester should be more similar to the rest of the fall semesters. In order to compare the Earth Science Department to the Physical Science Division, plotting the percentage of full time or part time instructors makes more sense to me and is shown in a plot below.



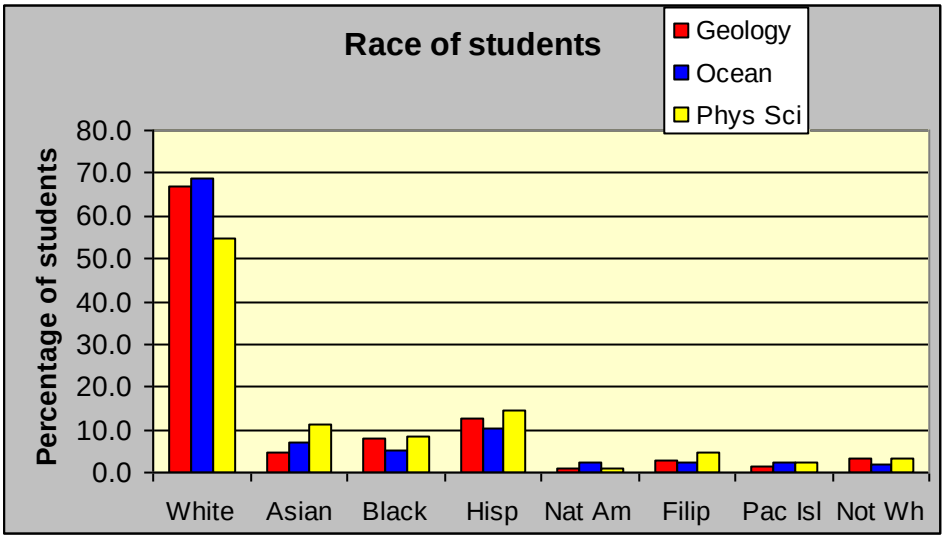
Percentage of FT FTE in the Earth Science Department. The Earth Science Department is on the left and the entire Physical Sciences Division is on the right. The values include both Geology and Oceanography classes.

The percentage of Earth Science FTE taught by the full time instructor. The full time instructor does not teach in the summer. The Fall 2005 data are corrupted.



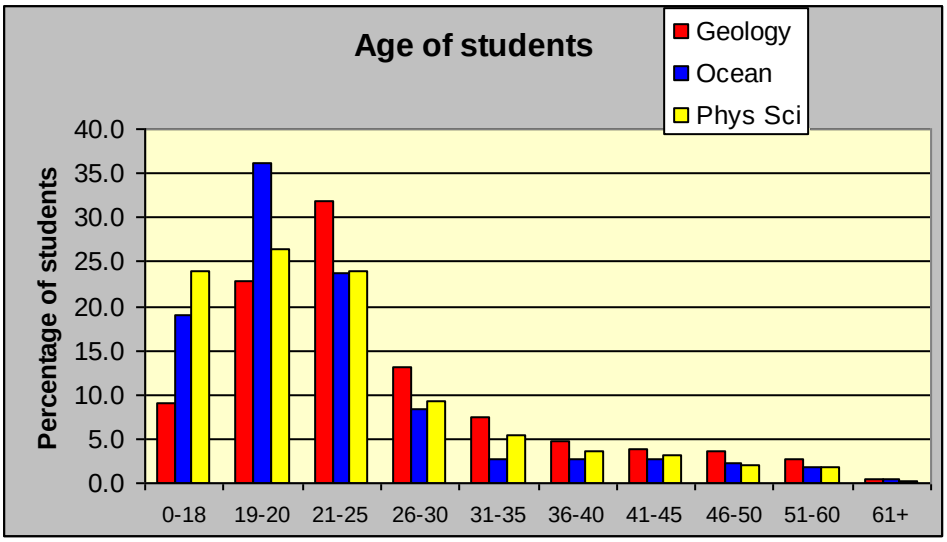
Student Gender: from left to right, the bars represent Geology, Oceanography, and Physical Science averages.

Gender in Earth Science classrooms mirrors that of the Physical Science Division average. It seems that Geology preferentially attracts females whereas Oceanography preferentially attracts males. The origin of this discrepancy remains a mystery.



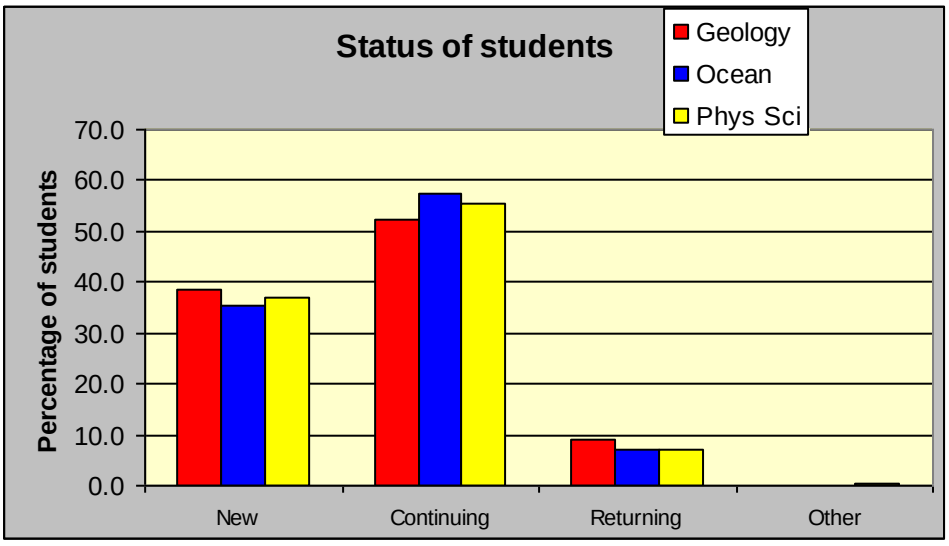
Race of students: from left to right, the bars represent Geology, Oceanography, and Physical Science averages.

The majority of Earth Science students are white, even more so than the Physical Sciences average. Asian, Black, and Hispanic students make up most of the remaining students, both in Earth Science classrooms and in the Physical Sciences Division.



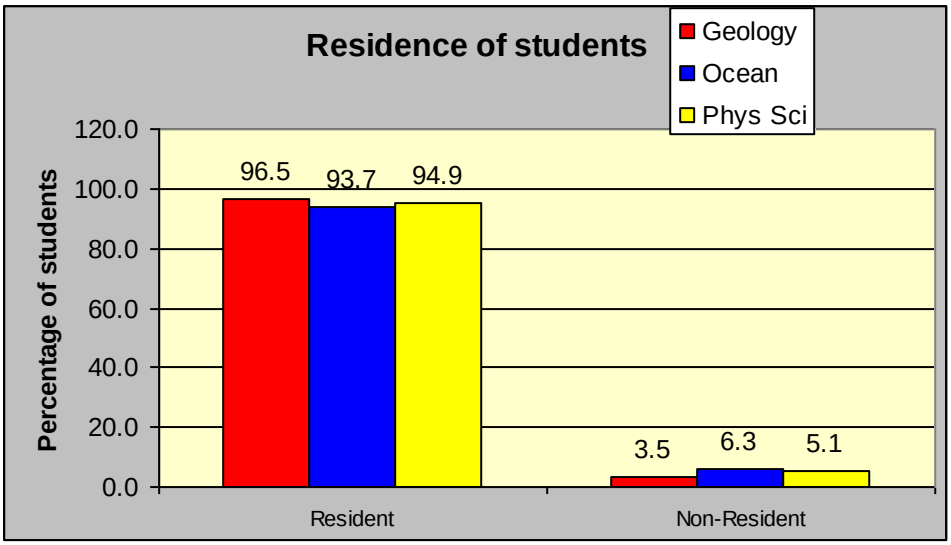
Age of students. The bars for each age group represent, from left to right, Geology, Oceanography, and Physical Science averages.

The age of most students in Earth Science classes fall in the 19 through 25 age groups. This is the age of "traditional" transfer bound students. All of the Earth Science offerings are physical science lab classes required for graduation from MPC and most universities. Thus, we infer that most students taking Earth Science classes are doing so with university transfer or AA degree completion as a main goal. Oceanography classes tend to attract younger students while geology classes tend to attract older students. The origin of this discrepancy is a mystery.



Student Status: bars in each category represent, from left to right, Geology, Oceanography, and Physical Science averages.

The student status closely mirrors the Physcial Sciences division as a whole. Most Earth Science students are either new or returning.



Student Residence: Bars represent, from left to right, Geology, Oceanography, and Physical Science averages.

Like the rest of the student demographics, the residence of Earth Science students closely matches that of the Physical Sciences Division. Most of our students are local residents and only a small percentage pay the non-resident fees.

2. Student Learning Outcomes (SLOs)

The Earth Science Department does not offer a degree or certificate, it is rather a collection of three classes, each of which a student may take to satisfy AA degree and university transfer requirements. Each Earth Science course has specific SLOs associated with it.

In general, however, students completing any Earth Science course should be able to:

-Give examples of how the scientific method can be used to investigate the Earth.

-Interpret basic tectonic and erosional processes given regional topographic/bathymetric information.

-Cite examples of how Earth processes are inter-linked and inter-related.

-Interpret ocean or solid earth structure in three dimensions given surface information.

-Describe location using the latitude and longitude system.

-Interpret topography or bathymetry from contour maps.

-Distinguish between the three major rock types: igneous, sedimentary, and metamorphic.

The Earth Science Department collects evidence of student learning by assessing tests, projects, and other student assessment opportunities during each class. Currently, there is no effort to follow up on Earth Science course graduates to assess our affect on these students one, two, or more years after taking our courses.

3. Data For Occupational Programs

The Earth Science Department is entirely academic; there are no occupational classes.

4. Current Scope and Sequence of Department's Course Offerings

The Earth Science Department currently offers three courses:

Oceanography 2: Introductory Oceanography

Geology 2: Introductory Geology

Geology 8: Earth Catastrophes and Disasters

Each of these courses contains a 3-hour per week lab and is transferable to UC and CSU as a physical science lab class. Most of our students take these classes to fulfill this requirement or to obtain an AA from MPC or other community college.

The Earth Science Department currently does not offer any certificates or degrees.

5. Course Scheduling

Students have many options in scheduling their Earth Sciences classes. Weekday, evening, and weekend options are all available. An in-depth study of timing conflicts has not been attempted. One option we may try in the future is an 8 am lecture time for Oceanography. Since most of our students are the "traditional" transfer type of student, most of them are new or continuing, and most of them are fairly young, we believe a high proportion of them are still used to beginning their school day at 8 am, as is done in high school, and therefore might be willing to attend an 8 am lecture.

The most recent distribution of class times that the Earth Science Department offers is shown on the table below. Class times have varied slightly over the years. In the past, during the spring semesters, Oceanography was offered on Mondays and Wednesday mornings and Monday and Wednesday evenings, while Geology was offered on Tuesdays and Thursdays. The Fall 2006 semester was the first time that Geology 8, Geologic Disasters and Catastrophes was offered.

Each of our courses has a two-hour lab scheduled each week. In order to be a transferable physical science lab course, however, UC and CSU require a three-hour weekly lab. We make up the difference by requiring two eight-hour field trips each semester in each Earth Science course.

In the summer semesters, we have traditionally offered two Living Room Series Geology 2 sections. During the Summer 2006 semester, for the first time, we offered an eight-week version of Oceanography 2. This offering was not well attended and we will probably not attempt this again.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Ocean 2 Lecture 9-10		Ocean 2 Lecture 9-10		Ocean 2 Lecture 9-10	Geology LRS* Lab 8-12
Geology 2 Lecture 10-11		Geology 2 Lecture 10-11		Geology 2 Lecture 10-11	
Ocean Lab 11-1		Geology 2 Lab 11-1			
Ocean Lab 1-3		Geology 2 Lab 1-3			
Geology 8 Lecture/Lab 6-8	Geology 2 Lecture/ Lab 6-8	Geology 8 Lecture/Lab 6-8	Geology 2 Lecture/ Lab 6-9		

*LRS =Living Room Series

6. Staff and Workload

Alfred Hochstaedter is the author of this report and is the only full-time member of the Earth Sciences Department. He has a PhD and typically teaches about 1 TLU in the Earth Sciences Department. In the past he taught a 4-unit lab class for the MAST department, but that course has been discontinued. This academic year he is Academic Senate President, which comes with TLUs, so he is teaching a bit less this academic year. Under the current arrangement, he teaches the Oceanography 2 class and the daytime Geology 2 class (but not the lab portion of this class).

The Earth Science Department employs a number of part time teachers in to offer all of the Earth Science classes. All of these individuals have master's degrees in Geology or Earth Sciences. They include:

Jean Grace teaches the Tuesday/Thursday evening Geology 2/2L class.

Leslie Turrini-Smith teaches the day time Geology 2L class.

Gary Conley teaches the Saturday Living Room Series Geology 2/2L class.

Kara Kuvakas teaches the Geology 8 class.

7. Faculty and Staff Satisfaction with the Program and its Ability to Meet Student Needs

In general we're satisfied. The Earth Science Department offers rigorous Physical Science classes that provide an environment for students to employ the scientific method to investigate and answer fundamental questions about the natural world around them.

Over the last year we reorganized the Earth Science classroom to make it more inviting and accessible. SLOs were written for each Geology 2 Lab taught by Leslie Turinni-Smith.

8. Adequacy of Staffing, Supplies, Equipment, and Facilities

The staffing, supplies, and equipment are adequate. We have a ~$900 supply budget through which we can replace some of our lab supplies as they become worn out or damaged through normal use.

Our facility is inadequate. The Physical Science Building is an old and aging building with an antiquated heating and ventilation system. Although work has been done on it, Physical Sciences 106, our Earth Science classroom, is often uncomfortably cold on cold days or in the evening, requiring students to wear sweaters, jackets and hats. This cold environment is not a conducive learning environment.

Our fieldtrip budget is inadequate. The Earth Science Department is committed to providing field experience for all Earth Science students. We believe that each student should experience the ocean first hand on a cruise and/or see rocks and landscapes outside to have a better idea of what is being discussed in the classroom. Our field trip budget is currently inadequate to provide bus/boat transportation for the two field trips required each semester by each of the Earth Science classes.

We have tried running field trips by carpooling in individual cars, with unsatisfactory results. With individual cars, students get lost, get separated and can't find all the field trip stops, use gas resources inefficiently, and cannot all fit into field trip stops with limited parking such as Pinnacles National Monument. We would like to provide two bus trips each semester for each class. We currently combine classes on field trips in an attempt to attain this goal, but still run short of funds every semester. An increased field trip budget is the Earth Science Department's most pressing need.

9. Influence of External Factors

External factors have not seemed to influence the Earth Science Department very much. Our FTES have remained in line with Physical Science FTES as a whole. We have not actively responded to any external challenge in the past six years.

C. Student Information

1. Student Programmatic Expectations and Goals

Students expect to complete a portion of their general education graduation and/or transfer requirements. A small percentage of students plan to continue in Earth Sciences for a degree from another institution. We serve both categories of students by providing a rigorous, challenging, informative, and hopefully enjoyable physical science lab class focusing on the Earth Sciences.

2. Indicators of Student Satisfaction

We regularly assess student satisfaction with teachers as part of MPC's regular instructor evaluations. In general, students have been satisfied to extremely satisfied with their Earth Science instructors. In the past six years, we have not made any effort to assess student satisfaction with the Earth Science "program". Since our "program" for nearly all students consists of taking a single class, it is difficult to separate student satisfaction with the "program" from student satisfaction with a particular teacher.

The Earth Science Department deals with student complaints by offering the student the opportunity to talk with the Department chair, the Physical Science chair, and/or the vice president of Student Affairs. In my seven-year tenure in the Earth Science Department we have had one complaint in which the student was given the opportunity to speak with the Physical Science Division chair. This conversation satisfied the student and the complaint did not go any further. In my seven-year tenure, to my knowledge, we have never had a student make a formal challenge on a grade.

We have not felt the need to make any program changes based on student complaints or measures of student satisfaction. Either the students are adequately satisfied, or we are not hearing the signal on student satisfaction.

3. Student Progression

Most students progress quite well through the Earth Science "program." They take one class and they're done.

4. Promotion of Student Access, Success, and Equity, and Student Barriers

The Earth Science Department promotes student success by working closely with the Academic Support Center. Nearly each semester we have students who have done well in Earth Science classes return as tutors under the direction of the Academic Support Center. This program has been a tremendous success for us. Many times current students feel more comfortable going to a fellow student for help rather than approaching the instructor directly.

The main barrier that potential Earth Science students face is the physical nature of participating in the Earth Science field trips. Handicapped, older, or other physically challenged students are the main ones to face these barriers. On our field trips, students have to be able to get on and off a bus and walk less than a mile to some of the field trip sites. We also go on an ocean cruise where students must be able to spend a few hours on

a boat on the open ocean. Seasickness presents problems for a few students every semester.

Situations where physical limitations prevent students from participating on field trips are handled on a case-by-case basis in the Earth Sciences Department. If a student has a physical or mental condition that prevents him or her from participating on a field trip, alternative activities are often arranged. These include going on the field trip by themselves, going on an alternative self-led field trip, or doing an alternative activity.

To my knowledge, we have not had a blind or paraplegic student confined to a wheelchair in any of our Earth Science classes in my eight-year tenure at MPC. If such a situation were to arise, significant alternatives to the Earth Sciences curricula would have to be developed.

D. External Relations

1. Similar Programs

Students have the opportunity to complete their physical science lab classes in a variety of departments including chemistry, astronomy, physics, and archeology. Student interest, scheduling issues, and reputation of instructors will probably be the strongest driving forces in determining which class students choose.

2. Coordination with other Programs

The Earth Sciences Department currently collaborates with the MAST department. Hochstaedter has taught classes for the MAST department in the past, and Oceanography 2 is required for the MAST certificate. In the past, the Oceanography class has participated in joint ocean cruises with the Marine Biology class, but changes in instructional personal in the Biology Department has prevented this kind of collaboration in recent years.

3. Institutional Support

The support the Earth Sciences Department receives from most of the campus programs is excellent. In particular, Academic Support has worked closely with the Earth Science department to provide student tutors for our classes.

The Instructional Technology department, in collaboration with Bob Otter, provides valuable support to Earth Sciences by keeping our computers and smart classrooms running.

The Human Resources department provides an invaluable service by facilitating all departmental hiring. The Earth Science department relies on qualified adjunct instructors and we often work closely with the Human Resources department to make sure that the recruitment and hiring process runs smoothly. We think they are extremely professional and gracious; we appreciate their efforts very much.

4. Community Involvement

Hochstaedter regularly participates as a Science Judge in the Otter Bowl, a regional and national competition for high school students. The students compete as teams in a Jeopardy-type of competition were all of the questions involve marine science. Hochstaedter has also contributed questions to be used in this competition.

Part III: Summary

The Earth Science Department offers physical science lab classes enabling students to satisfy general education requirements at MPC and at 4-year universities. The Department has a good reputation on campus for offering rigorous, stimulating, and informative classes in which students must use their critical thinking skills in order to succeed. Instructors generally get good to excellent evaluations from students.

A place for improvement in the Earth Sciences Department is in the development and standardization of SLOs throughout the department, including between instructors who teach different sections of the same class.

One of the challenges for the future will be maintaining or increasing enrollment in the face of declining enrollment at MPC. Increased marketing efforts could help these efforts.

Another challenge for the future will be to increase the field trip budget. Increases in any budget will be challenging in a climate of declining enrollments.

One opportunity for the future is the development of "general interest" courses about the environmental geology and ocean science issues facing the Monterey Bay area. In our area we have an educated population interested in the natural world around them. This potential target audience could be exploited by offering a series of short-course "modules" about the natural science of the Monterey Bay area. Potential topics include coastal erosion, water supply and storage, desalinization, seafloor habitats for declining fish stocks, or geologic history of the Monterey Bay Area.

Another opportunity for the future is planning the remodel of the Physical Sciences building with state and bond funds. The FPP for this project was recently approved by the state. This effort will require research into what other Earth Science departments have done with recent remodels of their facilities. It remains to be seen how much will be possible with this project. It may turn out that new paint on the walls is all that happens in the Earth Science classroom.

Part IV: Recommendations/Goals

1. Previous Program Review Goals

Previous program reviews are currently unavailable. However, one goal that is listed every year in the Earth Science action plan is an increase in the field trip budget. This

goal has not yet been attained because of insufficient funds in a declining enrollment environment.

2. Department Goals (in order of priority)

►Maintain enrollment relative to the Physical Science Division
-As shown above, Earth Sciences enrollment is currently about 8% of total Physical Science Division enrollment. The goal is to maintain or exceed that percentage.

-Develop department brochures

-Distribute brochures to A&R, counseling and other places on campus where students go for advice

-Develop flyers announcing classes before registration for each semester

-Hand out flyers to each current student to give to other prospective students before registration starts for the following semester

Responsible Person: Hochstaedter with possible volunteer help
Timeline: 2007 for the brochure; ongoing for the flyers

►Ensure fulfillment of three hours per week of lab through two, day-long supervised field trips by each Earth Science student

- Increase field trip budget.
- Include field trip budget increase in Action Plans consistently
- Argue for high priority within the Physical Science Division
- A successful weekend Earth science field trip depends on several factors

-Safely transporting all students to each field trip site

-Carpooling exposes students to riding in cars with drivers of unknown safety records

-An accident involving students in a private car in a required field trip could expose MPC to litigation

-Adequate restroom facilities

-Busses without restrooms or private vehicles require students to use limited restroom facilities at each field trip stop, when available. With ~40 students on a field trip, this can take quite a long time.

-In private cars, students tend to stop for restroom facilities causing them to be late to the next field trip stop or lose the group entirely.

Responsible person: Hochstaedter
Timeline: probably ongoing

►Meet with all Earth Science Department personal about SLOs for each Earth Science Department course

-Assure that each instructor is comfortable with the SLOs for that class.

-Establish opportunity for input from each instructor about SLOs.

-Make sure that SLOs are consistent between instructors who teach different sections of the same class. This may be most tricky for the Living Room Series version of Geology 2.

Responsible Person: Hochstaedter with input from part time instructors as time, interest, and willingness allows
Timeline: ongoing

►Investigate possibilities of developing general interest short courses on Monterey area environmental geology and oceanography

-Investigate whether this is a direction that MPC would like to go; these would probably be non-transferable classes and may be non-credit classes.

-If this idea is supported by Physical Science and MPC leadership, then courses will be develop through the Curriculum Committee process.

Responsible person: Hochstaedter
Timeline: 2007 and beyond

►Participate in the planning for the remodel of the Physical Sciences building

-Request furnishings, blinds, and whatever else is possible commensurate with the scope of the remodel project, which is currently ill-defined.

Responsible person: Hochstaedter
Timeline: currently unknown

4. Budget Requests

The most important, on-going Earth Science budget request is to increase its field trip budget. Transportation via bus is the only way to efficiently transport a class of students to a large number of field trip stops during a weekend field trip. The geology classes require two weekend field trips and the Oceanography class requires one weekend on-land field trip and one ocean cruise.