Listen to the ocean from western music compositions

*Chi-Min Liu[1], I-Chun Chen[2]

1. Chienkuo Technology University, 2. Taipei Municipal Xin-Yi Junior High School

In the view of geoscience, ocean study is usually referred to scientific fields such as physical oceanography, chemical oceanography, marine biology and marine geology. In this paper, a dialogue between ocean science and music, i.e. between science and humanity, will be briefly demonstrated by introducing some compositions. Wave conditions, climate change, coastal landform, and other natural events around or over the sea are clearly and vividly presented in these music works. They are *Meeresstille* by Schubert, *Étude Op.25 No.12* by Chopin, *Fingal's Cave Overture* by Mendelssohn, *Der Fliegende Holländer* by Wagner and *La Mer* by Debussy. These works may give a novel way not for science teachers but also music teachers to deliver the knowledge of ocean science in classes.

Keywords: ocean, music composition

Taiwan's ocean-related departments and the numbers of students: A statistic survey

*Chi-Min Liu[1]

1. Chienkuo Technology University

The numbers of students enrolled in ocean-related departments are statistically studied in this paper. Data in *four* academic years are analyzed and compared. All of these departments are classified into four groups: marine science, ocean engineering, marine navigation and other related departments. It is found that the total number of students increases quickly from 2001 to 2016 at all level of academic degrees. Moreover, some new departments which include ocean tourism, ocean culture and general marine affairs are established in recent years as more applications and job opportunities of ocean affairs appear.

Keywords: ocean-related departments, enrolled students, ocean education

Quantitative study of wave resonance conditions for a two-fluid system

*Chi-Min Liu[1]

1. Chienkuo Technology University

Wave interaction occurs everywhere in oceans and plays an important role in changing wave profile, transferring wave energy, and communicating nutrients and pollutants. With specific conditions, a very strong interaction, i.e. wave resonance (WR), will occur. A pioneering work by Phillips (1960) ignited a new era of studying wave resonance. After more than half of a century, today WR is still a hot topic and continues attracting a lot of scholars involved in related theoretical and experimental studies. In general, higher-order solutions, more complicated boundary conditions, and more layers of fluids are of great academic values presently. In this paper, WR in a single fluid and a two-layer fluid is quantitatively demonstrated. Present results will be used to plan an experimental study in the coming future.

Keywords: wave resonance, two-fluid system

On the study of dynamic mooring line damping

*Wen-Yang Hsu[1], Tzu-Ching Chuang[1], Ray-Yeng Yang[1]

1. Tainan Hydraulics Laboratory, National Cheng Kung University

A mooring system is used for station keeping of an offshore floating structure and it is applied to resist external loadings via mooring line damping. The mooring line motions are classified as quasi-static and dynamic motions. Quasi-static motion is defined as a mooring line has a catenary shape and its lower end contacts with seabed, which usually occurs in a calm weather. On the other hand, dynamic motion means the mooring line is fully lifted from the seabed and it is in a stage of semi-taut or fully taut, which usually caused by an extreme event. The goal of this project is to study the static and dynamic mooring line damping and their importance for floating structures. The property of a single-point mooring line damping will be tested in an environment with various oscillating frequencies and amplitudes of driving forces. The tension force at top-end point and its trajectory will be measured or simulated, and they are further applied
in the methodology of free decay and indicator diagram for calculating mooring line damping. These topics
will be studied experimentally and numerically. There are three stages for experiments, including the establishment of devices for measuring mooring line damping, tests for static mooring line and dynamic mooring line. The spring, rotational disc and wave flume are used as driven forces to trigger static and dynamic mooring line motions, starting from a single freedom to multiple freedoms. Two time-domain numerical models, a direct forcing immersed boundary solver for Navier-Stokes equation and OrcaFlex, will
be applied to study mooring line damping. Moreover, the drift, resonant condition, snap loads and statistical
properties for mooring line will be investigated.

Keywords: mooring system, floating structure, snap load