PROCEEDING

Kentingan Physics Forum
Acoustics Geophysics Cluster Meeting 2011
An International Conference and Workshop on Acoustical & Geophysical Advances & Applications

From Understanding to Innovations for The Better Planet and Living

Solo Paragon Hotel, March 8-9, 2011

Organized by:
Physics Department
Gadjah Mada University
Indonesia
Proceedings
Kentingan Physics Forum
Acoustics Geophysics Cluster Meeting
An International Conference and Workshop
on Acoustical & Geophysical Advances & Applications

From Understanding to Innovations for the Better Planet and Living
Solo Paragon Hotel, March 8-9, 2011

Steering Committee
The Dean of Faculty of Math. & Nat. Sciences (FMIPA) UNS, The Head of Physics Dept. FMIPA UNS, Ari Handono Ramelan (IIAP-Kentingan Physics Forum), Iwan Yahya (iARG Physics Dept. FMIPA UNS), Ashok Kudtarkar (Bruel&Kjaer South Asia Pacific).

Reviewers Board
Prof. Benjamin Soekarno (Bandung Institute of Technology-Indonesia), Dr. Hussein Akil (LIPI), Prof. Kirbani Sri Brotopuspito (Gadjah Mada University-Indonesia), Dra. Suparmi, MA., Ph.D (Sebelas Maret University-Indonesia), Drs. Cari, MA., Ph.D (Sebelas Maret University-Indonesia), Ir. Ari Handono Ramelan, M.Sc, Ph.D (Sebelas Maret University-Indonesia).

Editorials Board
Budi Purnama (Editor in Chief), Sorja Koesuma, Iwan Yahya.

Organized by:
Physics Department of Sebelas Maret University
Jl. Ir. Sutami 36A Kentingan Surakarta 57126
INDONESIA
http://iiap.mipa.uns.ac.id
FOREWORD

KPF Cluster Meeting is a sub activity of Indonesian Institute of Applied Physics IIAP [Formerly Kementerian Physics Forum, KPF] and dedicated for review and disseminates state of the art, the present and latest findings and exchange ideas among physicists, researchers, and practitioners involved in certain stated area or cluster of physics and its application.

Current Acoustics and Geophysics Cluster Meeting AGCM2011 is the first cluster meeting and focused on Acoustics and Geophysics and its applications. We strongly hope that the outcome of this meeting could stimulate and accelerate of advancement in knowledge and its applications which are essential for future green development of Indonesia.

We are deeply grateful to the invited speakers and authors for their contribution, papers and presentations that make this meeting possible through their high dedication on preparation the manuscript and for sharing their knowledge and experience.

We are indeed honored to associate this event with the 35th anniversary of Sebelas Maret University. Finally, we are appreciating the very kind cooperation of Sebelas Maret University anniversary committee and also our International Office for the direction and financial support. We would like to thank our entire partners and sponsors for their cooperation and financial support as well.

Sorja Koesuma
Chairman of AGCM2011
Solo, Indonesia
## Contents

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Author(s)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IARG Advance in Power Generating Sound Absorber</td>
<td>Iwan Yahya</td>
<td>1-4</td>
</tr>
<tr>
<td>2.</td>
<td>Analysis of Reservoir Physical Parameters with Approach</td>
<td>Supriyono, Anin Naim, Agus Setyawan, Udi Harmoko, Endro Hartanto, Mualimin</td>
<td>5-8</td>
</tr>
<tr>
<td></td>
<td>Extended Elastic Impedance (EEI) for Predicting The Spread of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reservoir Sandstones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>On Board Data Handling (OBDH) for LAPAN-A2 Satellite: Design</td>
<td>Haryono, Jazi Eko Istiyanto</td>
<td>9-14</td>
</tr>
<tr>
<td></td>
<td>and Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>The Study Of Seismic Activities And The Local Earthquake</td>
<td>Ika Andesmawati, Thaqibul Fikri Niyartama, Tony Agus Wijaya</td>
<td>15-18</td>
</tr>
<tr>
<td></td>
<td>Distribution At Yogyakarta On The Basis Of 2010 Bmkg Seismicity Data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Gravity Depth Sources Estimation of Ungaran Volcano using</td>
<td>Agus Setyawan</td>
<td>19-22</td>
</tr>
<tr>
<td></td>
<td>Spectral Analysis and Euler Deconvolution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Selection Component of On Board Data Handling (OBDH) for Low Earth</td>
<td>Jazi Eko Istiyanto, Haryono</td>
<td>23-28</td>
</tr>
<tr>
<td></td>
<td>Orbit (LEO) Satellite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Investigation On The Role Of Cavity And Slit Of Cavity Resonators</td>
<td>Nugroho Susilo, Luciana Kristanto</td>
<td>29-32</td>
</tr>
<tr>
<td></td>
<td>To Sound Absorption Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Microseismic Signals In The OBS Meramez Data Recording</td>
<td>Gatot Yuliyanto, Kirbani Sri Brotopuspito, Wiwit Suryanto</td>
<td>33-38</td>
</tr>
<tr>
<td></td>
<td>Yogyakarta Earthquake Using Gutenberg-Richter And Mc.Guirre Method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Measurement of rock abrasivity for Marine erosion study in the west</td>
<td>Muhammad Farid, Sismano, Wiwit Suryanto</td>
<td>43-46</td>
</tr>
<tr>
<td></td>
<td>part of Bengkulu Province</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Study of Tectonic Earthquake Activity Base on The Peak Ground</td>
<td>Lantu, Dewi Ika Kartika, Muh. Imran Tahir</td>
<td>47-50</td>
</tr>
<tr>
<td></td>
<td>Velocity (Pgw) Oriented in Sulawesi Island</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Synthetic Modeling the Earth's crust from receiver function data</td>
<td>Wiwit Suryanto</td>
<td>51-54</td>
</tr>
<tr>
<td></td>
<td>using the Nearests Neighborhood method</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Focal Mechanism and Tsunami Travel Time of July 17, 2006</td>
<td>Sorja Koesuma, Ryanti Rahmawati, Nugroho Budi W</td>
<td>55-58</td>
</tr>
<tr>
<td></td>
<td>Pangandaran Earthquake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Acoustic Performance Improvement of Sugarcane Waste based Block</td>
<td>Harjana</td>
<td>63-64</td>
</tr>
<tr>
<td></td>
<td>Sound Absorber</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Measurement of Rocks Abrasivity for Marine Erosion Study in The West Part of Bengkulu Province

Muhammad Farid¹, Sismanto², Wiwit Suryanto²

¹Department of Physics, Mathematical and Science Faculty, Bengkulu University.
²Laboratory of Geophysics, Mathematical and Science Faculty, Gadjah Mada University.
moh_farid50@yahoo.com

ABSTRACT

Studies of coastal erosion has been carried out by measuring the abrasivity of several rock samples. The ocean wave is modeled by using an adjustable-pressure water spray instrument. The water spray pressure is measured using a vitrometry principle. The ocean wave frequency that pounding the beach is about four times per minute. Several samples used for this study are Qa (alluvium), Qv (swamp sediment), Qv (volcanic sediment), and QTsv (tufaseous claysones). From this study we observed that the rock abrasivity of each samples are Qa (0.0096 kg/m²/minute to angle 0°, 0.0096 kg/m²/minute to angle 30°, and 0.0092 kg/m²/minute to angle 45°), Qv (0.0076 kg/m²/minute to angle 0°, 0.0072 kg/m²/minute to angle 30° and 0.0072 kg/m²/minute to angle 45°), QTsv (0.0072 kg/m²/minute to angle 0°, 0.0068 kg/m²/minute to angle 30° and 0.0068 kg/m²/minute to angle 45°). The rock abrasivity can be used to measure the erosion rate in a coastal area.

I. INTRODUCTION

The Bengkulu provins located in 101° – 104° east longitude and 2°16′ – 5°13′ south latitude, parrel with Bikit barisan Vulcano, and face to Hindia ocean [1]. This location will cause strong waves and high frequency at the shore, which result abrasion or marine erosion.

Suwarsono [2] told that waves frequency in Bengkulu shore average eighteen times in five minutes. The Faizon research (2001) in Seluma regency was got waves frequency twenty times in five minutes.

There are two factors in the rock shore as internal force which probably to abrasion, mangrove damaged and Pick Ground Acceleration (Farid hypotese). Demage of mangrove in Bangkulu shore more than 40% from all shore (Basri H, 2005), and quantity of Pick Ground Acceleration between 0.32 to 0.4 g (USGS, 2009).

The earthquake frequency in Bengkulu achieve six to ten times per month with strenght more than four in the Richter scale [3], will achieve Peak Ground Acceleration (PGA).

Every rock has strenght and weakness when recieves wave pressures. A weakness of rock which achieve erosion called rock abrasivity namely the mass be erased by ocean wave per area and per time.

The abrasion proses will changes shore line position, because a mass party float to sea. The rock mass float depend to rock types and ocean wave energy. The rock mass float is problem, because it cannot be calculated and will disappear to sea. Therefor must be made a ocean wave model which could be sprayed to the rock sample. Amount mass sample which fall out do to sprying are real rock abrasivity. The rock abrasivity is a parameter to know abrasion velocity in the area.

II. BASIC THEORY

2.1 Abrasion and abrasivity

Abrasion is prosess changes shore line which he caused by ocean wave and ocean current. Abrasivity is nuture of violence to can be abrasied. These to term will become a togetherness in the theme [4].

Figure 1. Coastal Abrasion in Serangai village North Bengkulu
By Santoso U [5], abrasion is marine erosion process by ocean wave energy which destructives. Damage of shore line do to abrasion was caused by it disturbed natural balance in shore area.

Although the abrasion can be caused by natural phenomena, but the human often as the main cause.

The velocity of abrasion in Bengkulu Province is very high, achieve two to five meter per years [6].

Several areas in Bengkulu shore exposed to abrasion result of sand mining, example in Pndok KelSapa and Mukomuko areas (Akbar, 2008)

From some of the facts mentioned above can be concluded that the rock beaches on the coast of Bengkulu province has a high abrasiveness, some examples of the image on the image first and second images give a real picture of the high abrasiveness of rock on the coast of Bengkulu province.

2.2 The Occurrence of Abrasion Process

The process of abrasion due to natural factors caused by wind blowing over the ocean waves and ocean currents that have the power to erode the beach area. The wave hit the beach to vibrate the soil or rock which over time will be separated from the mainland.

While the internal factors alone abrasion is caused by factors that allow for its rock abrasion itself include: youth aged rock types (Qa, Qs, Qv, QTsv); loss of surface tension between soil particles, increasing the mass weight of soil; soluble binder; rise ground water; development of the land (water enters the soil clay) and liquefaction.

Despite so many parameters that give effect to the occurrence of coastal erosion but the parameters of the power of the waves remains the parameter most easily visible as a reference to the occurrence of abrasion. Therefore, studies or research to obtain the amount of beach rock abrasiveness keep using wave parameters as the subject and rock samples as objects.

2.3 Abrasivitas and outer Style

Beach rock is generally composed of elements that each bind one another (cohesion factor), thus forming a strong unity. This bond will remain strong if there is no external force (external force) are disturbing. To rock out style beach which is always disturbing is the wind, ocean currents, waves, vibrations, and the man himself.

Proceedings of Acoustics and Geophysics Cluster Meeting, AGCM2011

Waves are one of the external forces that seem visible and sustainable in the eroding shore so that the motion steps to become a model to emulate the process of abrasion. Abrasivitas rock which is defined as the quantity of the eroded rock mass per unit area per unit time, can be simulated by means of spray water on the surface of the rock within a certain time, so the rocks are falling (apart) can be weighed mass. Rocks that despite this broad unity when unity is called abrasivitas rock.

Pipe vitometer the L-shaped and both ends open, vertically placed right on the coast affected by erosion. At the bottom end of the pipe is placed directly facing the arrival of the waves so that when the waves came, the sea water will enter into the pipe until at an altitude of Δ vitometer h. Pressure waves on the beach will be the same as sea level pressure in the pipe vitometer Δ h it. In accordance with the laws of hydrostatics, the pressure in the pipe height h equal to pg Δ h (in units of Newton per meter squared), with p is sea water density (kg/m³), g acceleration due to gravity (m/s²) and high h Δ air deepwater pipeline vitometer.

High sea water as high as we move in the other tube despite the different surface area but the pressure will remain the same and continues to be constant in height h. The water in the tube is then sprayed on a beach rock samples selected. How to spray mimics the way the waves come on shore and the spray is also the same frequency with a frequency waves on the beach (the survey average of 4 times per minute).

In this way the beach rock samples are still quite young rocks from the time of the quarter, the transition between tertiary-quarter and tertieseperti Qa, Qs, Qv, and QTsv, can be measured abrasivitasnya. In this way the abrasivitas rocky beach can be one parameter to measure the speed of abrasion in a region.

III. METHOD

Survey was done as preliminary study to identify real coast condition. Parameters observed for the preliminary study consisted of rocks condition in coast abrasion site, frequency and strength of wake, wind speed, and qualitative distance to Sumatera West Road. Survey results of data and photographs were discussed to get description to follow up the result

3.1 Designing device

To simulate sea wave hitting the coast, a simple device (inexpensive one) is required to measure wave pressure. Therefore, it was designed a device made of PVC pipe with 5 in diameter and 100 cm length, connected with same type and size PVC pipe with L connection so the pipe has L shape.
Proceedings of Acoustics and Geophysics Chuter Meeting, AGCM2011

IV. RESULT AND DISCUSSION

The results from 3 angle variation \( (0^\circ, 30^\circ, 45^\circ) \) were revealed in following tables:

<table>
<thead>
<tr>
<th>No.</th>
<th>Spraying angle (degree)</th>
<th>Sample mass I (Qa)</th>
<th>Abraded mass (kg/m²/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0°</td>
<td>0.048</td>
<td>0.0096</td>
</tr>
<tr>
<td>2.</td>
<td>30°</td>
<td>0.048</td>
<td>0.0096</td>
</tr>
<tr>
<td>3.</td>
<td>45°</td>
<td>0.046</td>
<td>0.0092</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Spraying angle (degree)</th>
<th>Sample mass I (Qa)</th>
<th>Abraded mass (kg/m²/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0°</td>
<td>0.038</td>
<td>0.0076</td>
</tr>
<tr>
<td>2.</td>
<td>30°</td>
<td>0.036</td>
<td>0.0072</td>
</tr>
<tr>
<td>3.</td>
<td>45°</td>
<td>0.036</td>
<td>0.0072</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Spraying angle (degree)</th>
<th>Sample mass I (Qr)</th>
<th>Abraded mass (kg/m²/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0°</td>
<td>0.034</td>
<td>0.0068</td>
</tr>
<tr>
<td>2.</td>
<td>30°</td>
<td>0.034</td>
<td>0.0068</td>
</tr>
<tr>
<td>3.</td>
<td>45°</td>
<td>0.034</td>
<td>0.0068</td>
</tr>
</tbody>
</table>

When wave is the only parameter determining abrasion speed (coastal erosion), rock abrasiveness is element that determine abrasion speed. Data required was rock area, time and rock type to determine abrasion speed. It may be different when there were still many factors affecting abrasion rate. Particularly for coast in Bengkulu province and maybe in south coast of Java have similar abrasion characteristic. West coast of Sumatera and south coast of Java faces directly to meeting of two great plates (Indo-Australia plate and Euro-Asia plate) that will lead to often earthquake. Earthquake will be a parameter accelerating abrasion rate (in study process). Earthquake parameter did not have by each cost but sea wave was, so coast rock abrasiveness has universal characteristic. For coast having quarter rock, not in earthquake threat, not near road, its abrasiveness can be sued to calculate abrasion rate directly.

There are many corrections that should be considered. For example, it was required device that provide more similar wave behavior. Water spray may be corrected to equal wave behavior. When wave hitting coast by merging translation and rotation, water spray can only do translation although spraying position was conditioned no perpendicular, in certain angle.

Note:
As = water container
L = container height
h = total height
In sample context, sample taken was only soft one that can be eroded when spraying done. Sample from hardening rock cannot be found its abrasiveness with this method. However, rock abrasiveness is important because many parameters can be used to prove functioning of other parameters. Other parameter functions when abrasion rate is faster then calculation using abrasiveness. Other parameter is frequency of earthquake. Considering that Bengkulu province face directly to subduction (meeting of India-Australia plate and Eurasia plate), then the regions is vulnerable to earthquake. Parameter used to identify existence of a region vulnerable to earthquake may be indicated from PGA (Peak ground Acceleration) value. Higher PGA score indicates higher ground vulnerability of the site due to frequent earthquake.

Abrasiveness value of some rock types in area with Qs (alluvium) rock with specific mass of 2640 kg/m³ will undergo abrasion rate of 1.88 m/year, Qs with specific mass of 2740 kg/m³, its abrasion rate was 1.44 m/year; Qv with specific mass of 2560 kg/m³, its abrasion rate was 1.45 m/year; and Qs with specific mass of 2460 kg/m³, its abrasion rate was 2.15 m/year. It used following approach.

A region with area of A was hit wave that scrape the area. When abrasion rate v and abrasion depth l, rock segment density p and abraded mass m such as mass in figure 10, then, m = p.A.l

Abrasion rate = v/t = m/(p.A.l) or v = m/(p.A.t) = (m/A.t)*((1/p)

Ca is abrasiveness coefficient or rock abrasiveness

ρ = rock specific gravity (Qs=2640 kg/m³) and QTs = 2460 kg/m³

A= cross sectional area of sample rock.

Abrasion rate that only use single variable of wave strength did not indicate high abrasion rate, but in reality such as appear in figure 1 to figure 4, abrasion was very fast. Even in figure 1, it took only on night to cross road body (exactly night after earthquake in Padang, West Sumatera). Based on the reality, it is expected that abrasion rate in west coast of Bengkulu province is influenced by earthquake wake often occur in the area.

Figure 6. The element mass abrasion

V. CONCLUSION

Perpendicular or angled position of spraying device of did not significantly give different abrasiveness

There is tendency abrasiveness rate decrease along with rock age

The reduced rock abrasiveness indicates smaller coast abrasion rate in south Bengkulu, considering that rock in south Bengkulu tend to older than rock in north Bengkulu.

REFERENCES