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REMOTE SENSING APLICATION FORFLUXCO$_2$ IN THEOCEAN RELATION
WITH GLOBAL WARMING AND WORK SAFETY

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Abstract

Wilayah pesisir, tempat di mana perairan laut bertemu dengandaratan memang merupakan tempat yang unik dalam situasigeografi global. Mereka diberkahi dengan berbagai ekosistem pesisir seperti hutan bakau, terumbu karang, laguna, rumput laut, rawa asin, danestuari. Makna ekonomi yang unik sangat nyata karena sebagai fasilitasuntuk pelabuhan dan sebagai manfaat moneter yang terkait dengan perdagangan air dan juga sangat dihargai dan sangat menarik sebagai tempat untuk resor dan tujuan wisatauntuk liburan. Kombinasi air tawar dan air asin di muara pantai menciptakan beberapa habitat paling produktif dan terkaya di bumi,sebagai habitat kehidupan ikan dan laut lainnya bisa sangat bernilai bagi negara-negara pesisir. Polusi pantai dapat sangat mengurangi produksi ikan, seperti degradasi pembibitan ikan dipantai dan habitat lahan basah lainnya yang berharga. Perlindungan terhadapbadai yang diberikan oleh terumbu karang dan hutan bakau bisa hilang jika karang mati atau bakau dihilangkan. Perkembangan yang tidak tepat dan kerusakan yang menyertainya dapat mengurangi daya tarik lingkungan pesisir, yang sangat memengaruhi potensi wisata. Pengelolaan ekosistem pesisir dengan demikian sangat penting untuk pemanfaatan berkelanjutan, pengembangan dan perlindungan wilayah dan sumber daya pesisir dan laut.

Peningkatan CO_2 atmosfer dan potensi pemanasan global telah menjadi perhatian besar bagi masyarakat manusia. Fluks karbon dioksida antara udara dan laut adalah konsentrasi CO_2 di lautan yang dikendalikan oleh proses fisika, kimia, dan biologis. Ini dapat ditentukan dari perbedaan konsentrasi CO_2 udara-laut dan pertukaran karbon dioksida (CO_2) antara udara-laut, yang kaya akan nutrisi. Untuk mendeteksi hubungan fluks karbon dioksida dengan pemanasan global, perubahan iklim dan keselamatan kerja. Hasil penelitian memberikan informasi mengenai aspek-aspek berikut; fluks karbon dioksida (CO_2) berdasarkan pCO_2 permukaan laut secara klimatologis, dan efek suhu dan biologis musiman dan peningkatan CO_2 atmosfer serta potensinya terhadap efek pemanasan global. Kesimpulan: respirasi dan fotosintesis untuk mengurangi CO2 di alam sehingga tidak sebagai sumber bencana maka kita harus mengeksekusi, mengurangi sumber bencana misalnya; penggundulan hutan, pembakaran hutan, penggunaan bahan bakar fosil sehingga tidak mengganggu keanekaragaman hayati sebagai pendukung ketahanan pangan dan keseimbangan alam.

Keywords : *Kecepatan angin, PCO_2, TCO_2, SST, bencana, Pemanasan Global*

BACKGROUND

Coastal and marine are that have resource potential nature that is big and can be used for increase development. Resources at outline coastal and ocean areas consists of three groups, namely:

1. Resources can recover (renewableresources) include mangrove forests, reefs coral, seagrass, seaweed, marine fisheries resources and materials bioactive.
2. Resources cann't recover (nonrenewable resources) include petroleum and natural gas and all minerals and geology.
3. Environmental services, including functions coastal area and ocean as a placerecreation and tourisme, transportation mediaand communication, energy sources (such as: ocean thermal energy conversion, energy from ocean waves and tidal energy receding), educational and research facilities, defense security, shelter waste, climate regulators, and systems life support and ecological functions others.

Indonesia is an archipelago which has coastal resource potential and a very large and diverse ocean. Some of these resources, for example capture fisheries and fisheries resources cultivation, the mangrove forest that is found in along the coast or river estuary, reefs a very productive and distinctive coral in the tropics and other resources. However, in management coastal areas and oceans still face problems that are not easy, even very difficult and complex. Some problems fundamental problems faced and still difficult to overcome that is:

- Utilization of coastal areas that are not balanced so that there are regions that are utilized exceeding power capacity support sustainable (sustainable potential),on the contrary there are also coastal areas completely untapped.
- Development that doesn't pay attentionspatial structure so that pollution occurs andthe ocean.
- Human resources in the region whose quality is still very limited so that they cannot manage and optimally utilize.
- The condition of most coastal communities whose standard of living is still below the line poverty that often forces them to exploit natural resources exceeding its sustainable potential.
- Facilities and infrastructure in most coastal areas that are still very limited and not supportive of activities management in the region.
- Lack of investment in the marine sector, and a bunch of other problems.

PROBLEM'S RESEARCH

1. With satellite data, how does carbon dioxide (CO_2) change in the global ocean?
2. With the parameters of CO_2 Partial Pressure (pCO_2), SST, Salinity, pH How is the CO_2 change related to climate anomaly?

AIM AND OBJECTIVE RESEARCH

1. Detect CO2 Changes in relation to Global Warming.
2. Detect changes in CO2 pressure (pCO2), sst, salinity and pH in relation to climate anomaly.

REMOTE SENSING DEFINITION

There are various types of remote sensing definitions far. The following are given several definitions according to some people who are experts in remote sensing field.

- According to Lillesand and Kiefer (1979), Remote Sensing is science and art to obtain information about objects, area, or symptoms by road analyze the data obtained with use tools without direct contact against objects, regions, or symptoms studied.

- According to Colwell (1984), remote sensing a measurement or acquisition data at objects on the surface of the earth from satellite or other instrument above or far from the object being sensed.
- According to Curran (1985), Remote Sensing namely the use of radiation sensors electromagnetic for recording images earth environment that can interpreted so that it produces useful information.
- According to Lindgren (1985), Sensing Far from various techniques developed for acquisition and analysis information about the earth.Sabins (1996) in Kerle et al. (2004) explain that remote sensing is the science of acquiring, processing and interpretation the image that has been recorded originating from interactions between electromagnetic waves with silk object.

FUNGTION OF REMOTE SENSING

One attempt to obtain information about regional resource potential coastal and oceanic in order to optimize the management of coastal areas and the ocean is the use of technology remote sensing and information systems geography (GIS). Information about objects which is found in a location on the surface the earth is taken using sensorssatellite, then according to the purpose of the activityto be done, information about the objectit is processed, analyzed, interpreted and presented in the form of spatial information and spatial thematic maps using GIS.

Use of remote sensing data GIS has been done a lot in relation with coastal and marine areas in particular fisheries sector and regional management coastal and ocean, such as: sensing applications far to provide Potential Zone Information Fishing (ZPPI), land suitability waters for marine aquaculture and marine tourism, identification of potential areas coastal areas (such as mangroves, coral reefs, seagrass beds and sand), regional zoning marine conservation, analyzing economic potential coastal areas of small islands, observation coastline changes, pollution analysis aquatic environment and so on.

STRENGTHS AND WEAKNESSES AWAY SENSATION

Every method or technology alwaysSabins (1996) in Kerle et al. (2004) explain that remote sensing is the science of acquiring, processing and interpret the image that has been recorded originating from interactions between electromagnetic waves with silk object.

SATELLITE AND RESOLUTION

GIS (Geogrphy Information system) is one attempt to obtain information about regional resource potential coastal and oceanic in order to optimize the management of coastal areas and the ocean is the use of technology remote sensing and Information Systems Geography (GIS). Information about objects which is found in a location on the surface the earth is taken using sensors satellite, then according to the purpose of the activity to be done, information about the object it is processed, analyzed, interpreted and presented in the form of spatial information and spatial thematic maps usingGIS. Use of remote sensing data GIS has been done a lot in relation with coastal and marine areas in particular fisheries sector and regional management coastal and ocean, such as: sensing applications far to provide Potential Zone information Fishing (ZPPI), land suitability waters for marine aquaculture and marine tourisme, identification of potential areas coastal areas (such as mangroves, coral reefs, seagrass beds and sand), regional zoning marine conservation, analyzing economic potential coastal areas of small islands, observation coastline changes, pollution analysis aquatic environment.

STRENGTHS AND WEAKNESSES AWAY SENSATION

Every method or technology alwaystransparant, penetrating power to water limited.

1. Data accuracy is lower than that with the method of field data collection (survey in situ) caused by limitations of wave properties electromagnetic and long distances between transparent, penetrating power to water limited.
2. Data accuracy is lower than that with the method of field data collection (survey in situ) caused by limitations of wave properties electromagnetic and long distances between sensor with observed objects.

SATELLITE AND RESOLUTION

The utilization of the vehicle of interaction has been long used to observe environmental conditions ocean in the world. The spacecraft used for marine usually in the form satellite even though at first it usually is used airplane as a trial sensor. At first the camera was used for marine research but deep the development of the use of this camera has many weaknesses for research marine.

Marine satellites that exist todayjudging from the nature of their orbit can be distinguishedinto two, which is the usual polar orbit also synchronizes with the sun (sun-synchronous) and geostationary satellites too called geo-synchronous or earth-synchronous satellites or synchronous only. Satellite polar orbit moves around the earth continuously from north to south or on the contrary and pass through the pole (or close pole). This satellite passes through the equator at local time which is always the same (time local). Because it's called "sun-synchronous".Geostationary satellites surround the earth in the same direction with the rotational movement of the earth and with periods which is the same as the earth's rotation period which is 24 hour. Therefore this satellite will always work above a certain point on earth (in the area) equator). If seen from the earth then the satellite it is as if it stays in a certain position from the earth so that it is referred to as geosynchronous or geostationary. Some Examples of geostationary satellites are: Application Technology Satellite (ATS), Synchronous Meteorological Satellite (SMS)and Geostationary Operational Environment Satellite (GOES) owned by the USA, Meteorological Satellite (METEOSAT) which owned by ESA / EUROPE, Satellite Indian (INSAT) owned by (India) and Geostationary Meteorological Satellite (GMS) owned by Japan. The development of satellite sensors is shown with increasing data quality produced by the sensor. Satellite data generally referred to as satellite imagery (image), even though there are indeed satellites not satellite imagery. Meaningful image quality also the quality or quality of the sensor is determined by the resolution. There are several types of resolutions can determine the quality of satellite sensors. Some types of resolution are resolution spatial, temporal resolution, spectral resolution and radiometric resolution Spatial resolution can be understood from two point of view or definition. Viewpointfirst define spatial resolution asthe area on the surface of the earth that is represented by the smallest unit of sensor data (pixel). If one pixel represents a wider area in the surface of the earth then the sensor has a lower resolution and vice versa. In this sense unit Spatial resolution is a unit of area (m^2 or km^2). The second point of view defines spatial resolution as the closest distance from two different objects on the surface of the earth that are still can be detected as two objects by a sensor. In this second understanding, unit of resolution spatial is a unit of distance (m or km).

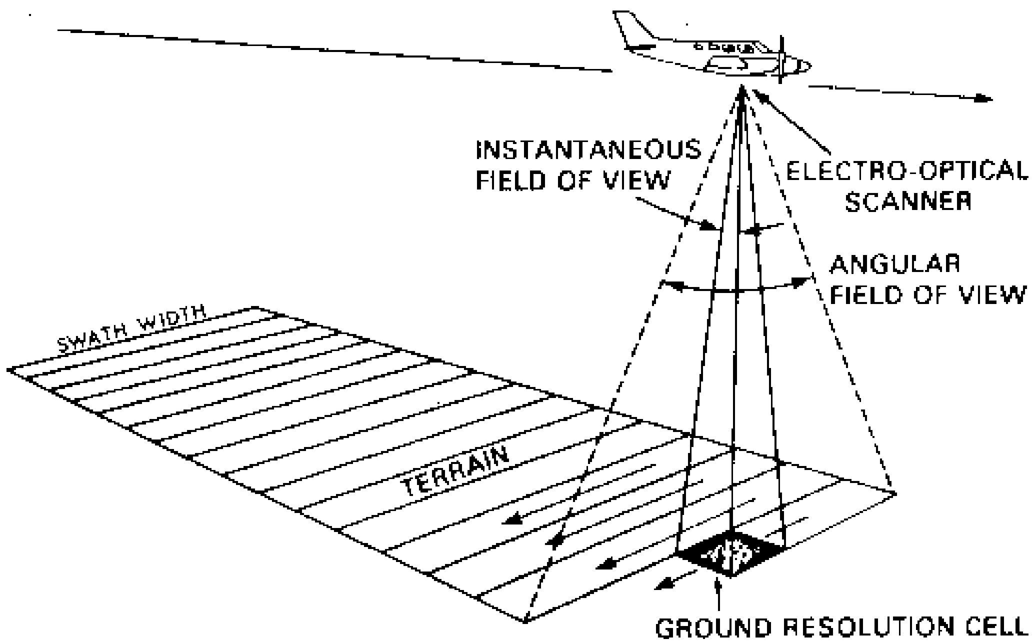

Figure 1. Illustration of Spatial Resolution

Temporal resolution is defined as duration time for satellite sensors to sense the same area for the second time. The unit is usually days, more many number of days needed for sensing the same area, the more low resolution of temperament, and vice versa. Spectral resolution can be interpreted as electromagnetic spectrum rangeused by sensing devices. Somethingsensors that have more band width small from the other sensor then the sensor can be said to have spectral resolution higher. Simply put, spectrum electromagnetic which is used for sensing the surface of the earth consists of visible spectrum (purple = 0.440-0.446; blue = .0446-.500; green = 0.500-0.578; yellow = 0.578-0,592; orange = 0.592-0.620; red = 0.620-0,700), near infrared (reflective), middle infrared (infrared short wave / reflective and emissive), infra thermal red (emissive) and microwaves, also LASER and LIDAR. In some cases, the spectrum is still subdivided into narrower range. Radiometric resolution can be interpreted as range of representations / quantization of data, which is usually used for raster format. The Julatcan be 2 bits (0-1), 3 bits (0- 3), 4 bits (0-15), 5 bits (0-31), 6 bits (0-63), 7 bits (0-127), 8 bits (0-255), 10 bits (0-1023), 16 bits (0- 65535). The larger bits owned by a sensor, then the connector can said to have a radiometric resolution which is high.

CONCEPT AND COMPONENTS AWAY SENSATION

Remote sensing is very dependent on electromagnetic wave energy. Wave electromagnetic can come from many things, but electromagnetic waves are the most important thing in remote sensing is light sun. Many sensors use energy reflection of sunlight as a sourceelectromagnetic waves, but there are some remote sensing sensors that are use the energy emitted by earth and emitted by that sensor own. Sensors that utilize energy from reflection of sunlight or earth's energy called passive sensors, while ones utilize energy from the sensor itself called active sensor.

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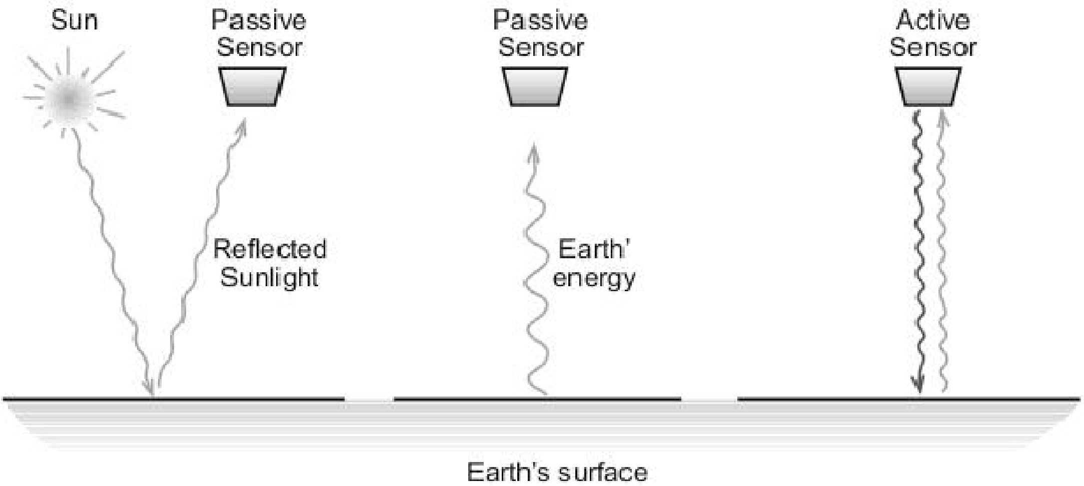

Figure 2. Reflected and emitted by a remote sensing sensor (Karle el al., 2004)

Remote sensing as a science, technology and art to detect and / or measure objects or phenomena on earth without touching the object itself requires a camera to capture the reflection of light from the object. For this reason, an attached camera is used on the spacecraft launched into outer space and often referred to as satellite. The camera installed on the satellite works as the sense of sight that does recording of the earth's surface at the time the satellite circulates around the earth according to orbital line or circulation. The sensor is on the camera will detect surface information earth through its solar radiation energy reflected by the surface upward, energy data this radiation reflection is processed into electrical symptoms and data is sent to a satellite processing stationthat is on earth.

In a remote sensing system there are 4 main components are: (1) energy sources, (2) interaction of energy with the atmosphere, (3) sensors as a tool to detect information and (4) objects the target of the observationEnergy sources The main source of energy in sensing far is electromagnetic wave radiation (GEM). GEM is a form of energy which can only be observed through interactions with an object. This form of energy known as visible light, X-rays, infrared and microwave. GEM is part of a continuous spectrum. GEM is formed by two components at once that is, electrical components and components magnetic (Picture ...) and influenced by electrical and magnetic properties of objects interact with the GEM.

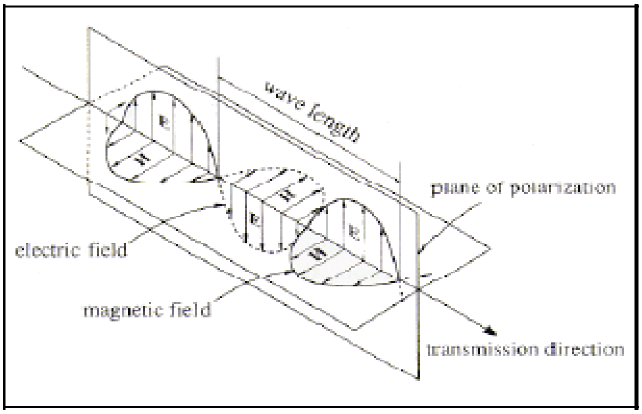

Figure 3. Electromagnetic Wave Radiation

There are two commonly used hypotheses to explain the nature of the GEM model wave and particle model. GEM as waves move at a certain speed which depends on the wavelength (λ). At every electromagnetic wave apply the following equation:

C = f. λ ………. (1)

Where:

C = velocity of electromagnetic waves (m / sec) = 3 x 108 m/sec

F= frequency (1 / sec)

λ = wavelength (m)

The magnitude of the percentage reflection value of the object will reflect the color of an object. For vegetation it will be seen on the spectrum visible light between 0.4 - 0.7 μm, with a value 0.4 - 0.5 μm for healthy leaves, namely at blue and green range (mostlyelectromagnetic waves absorbed by chlorophyll) and if the leaf color is red it will seen at 0.65 μm. Percentage of reflection from areas covered by vegetation range from 5 - 50% depending on the density and type of vegetation covering the area. For land dry open will look gray brown with reflections ranging from 5 - 45%. While the clear water is the light spectrum will be at wavelength 0.4 - 0.78 μm with less reflections from 5%. Schema of the electromagnetic spectrum can be seen in Figure 4.

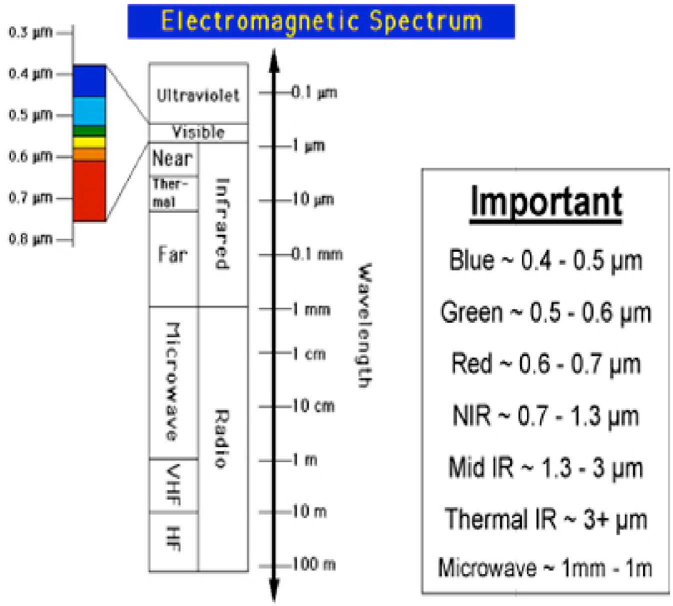

Figure 4. Electromagnetic spectrum

The GEM spectrum used in remote sensing can be seen in Figure 5.

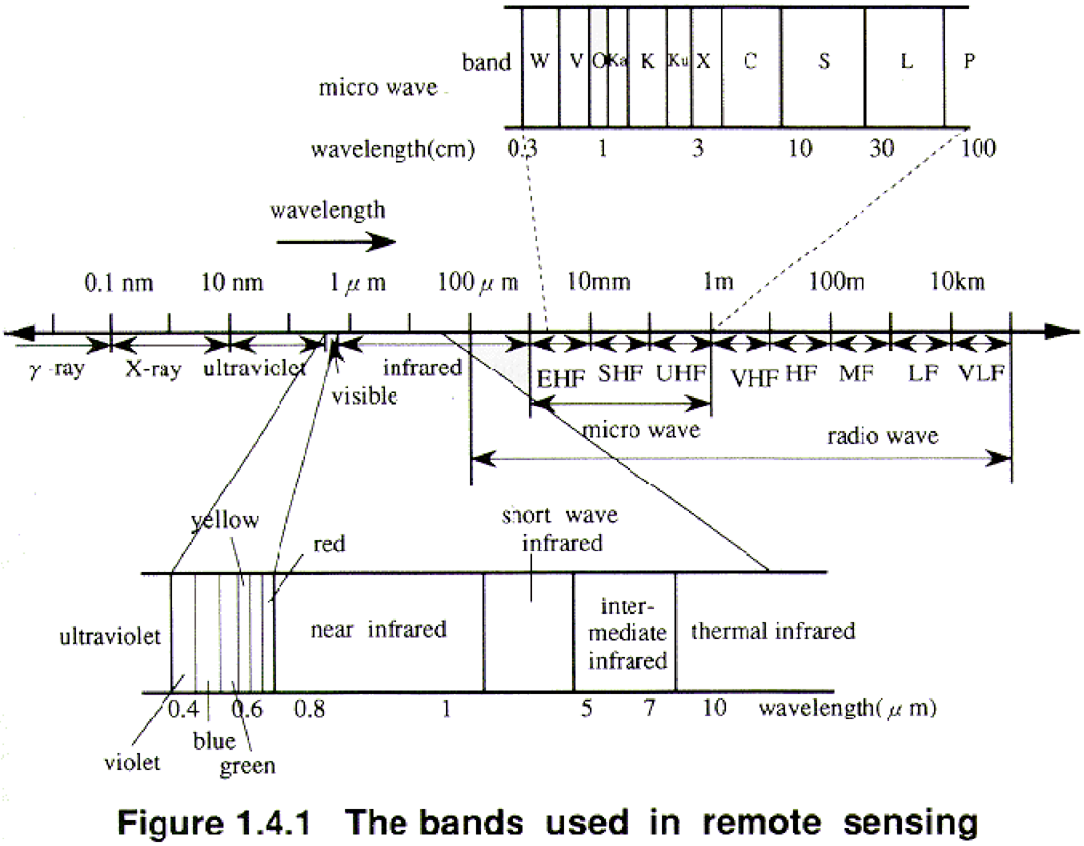

Figure 5. Spectrum of GEM used in remote sensing (JARS, 1993)

Some important parts of the GEM used in remote sensing namely:
0.3 - 0.4 µm: ultraviolet
0.4 - 0.7 µm: visible light
0.7 - 3.0 µm: near infrared
3.0 - 8.0 µm: middle infrared
8.0 - 1000 µm: thermal infrared
1 mm - 100 cm: microwaves

The particle model is used for explain the amount of energy contained by GEM. GEM is emitted in the form discrete called quanta and photon. The amount of energy from GEM meets the law Plank as follows:
E = h. f .... (2)
Where:
E = quantum energy in joules
h = the constant Plank's
(6,624x10-24 Joules. Seconds)
f = frequency of emission (Hz)

The relationship between the wave theory model and the quantum theory of GEM is written as following: .... (3) From equation 3 above we can see that quantum power is proportional inversely proportional to the length the wave. Longer, longer the wave used, it will be even more low in the dead.

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The sun is a source of radiation the most important electromagnetic for remote controller. But all things at temperatures above absolute zero (0^0K or - 273^0C) emits electromagnetic radiation continuously. Therefore, the object is in the earth is also a source of radiation, though the magnitude and spectral composition are different with the sun. The amount of power radiated by an object is aFigure 5. Spectrum of GEM used in remote sensing (JARS, 1993) Some important parts of the GEM used in remote sensing namely:

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3. Non Selective Scattering.

Scattering occurs due to the atomic particles dimeternya several times greater than that wavelength about it. This particle is mainly a point water or dew in the atmosphere. Absorption is a process that causing GEM energy to be absorbed by atmospheric particles. This event generally occurs on the infrared wave. The size the influence of the atmosphere on GEM depends at the GEM wavelength. Consequence the influence of the atmosphere on the emission of GEM then not all energy from GEM can forwarded to the surface of the earth. The size the transmitted beam depends on the amount of wavelength that exists.

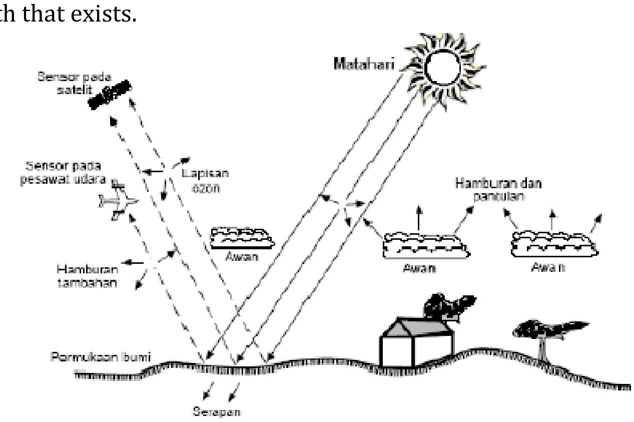

Figure 6. Interaction Between Power

Electromagnetic and Atmospheric Object Interaction with GEM In the marine environment, GEM is long certain waves experience transmission, so that the energy received by the sensor can comes from the surface, material in the water column and basic material. The GEM is coming on objects will interact in the form of reflections, absorption and transmission. The amount of energy that is reflected, absorbed and transmitted fulfill the conservation law of energy asfollowing:

Ei (λ) = ER (λ) + EA (λ) + ET (λ)
ER (λ) = EI (λ) - EA (λ) - ET (λ)

Information:
Ei = energy that affects objects
ER = reflected energy (recorded by sensor)
EA = energy absorbed
ET = transmitted energy
Ee = emission energy
(λ) = wavelength

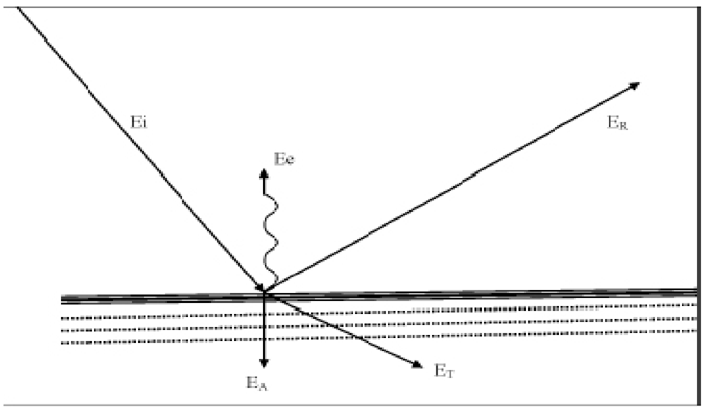

Figure 7. GEM Interaction with Objects

The amount of GEM reflected back by objects depending on the type and condition object. Likewise, if it's long different waves regarding the object the same, it gives different reflections also. This nature is the basis of an introduction objects with remote sensing. Amount of energy which is reflected by an object at length different waves relative to the energy received is called a spectrum reflectance. Based on Figure 8 it is clear that the same object has a reflection value different at that wavelength different. For example in vegetation, at length wave 0.4 - 0.7 μm (visible) value the reflection is around 10%, but at wavelength 0.8 - 1.3 μm (infrared), the reflection is around 50%. At length the same wave but with an object different ones will reflect that energy different. There are different reflections due to the material contained by each different objects so that the reflective power also different. Figure 8. Reflectance spectrum from the ground, vegetation and water Sensor

The sensor is the tool used for detect GEM emitted by anobject. Based on energy sourcesdetected, the sensor can be divided into passive sensor and active sensor. Passive sensor is a sensor that detects reflections or GEM emissions from natural sources. Active sensor is a sensor that detects GEM responses from objects emitted from energy sources artificial which is usually designed in a vehicle that carries a sensor. Based on length waves, sensors are divided into sensors visible (0.4 - 0.7) µm, infrared sensors (1 - 10) µm and microwave sensor (1 mm – 1 m).

Very important things related with sensors namely spectral characteristics and spatial characteristics. Spectral characteristics related to the width of the band. A sensor which has a smaller band width from other sensors, the sensor can said to have a spectral resolution higher. For example, Landsat TM sensors

Reflectance (%)

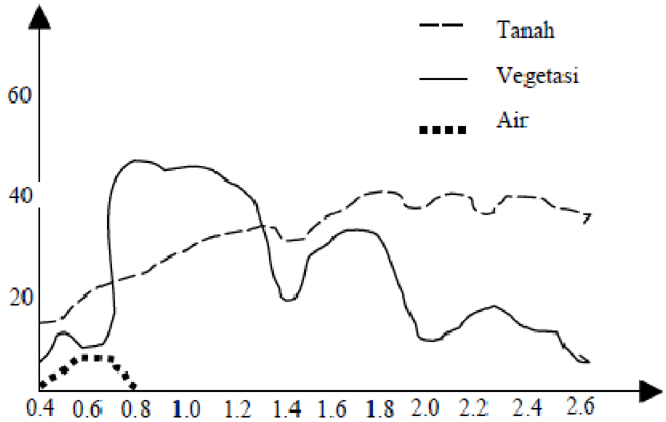

Figure 8.Reflectance spectrum from the ground, vegetation and water Sensor.

The sensor is the tool used for detect GEM emitted by an object. Based on energy sources detected, the sensor can be divided into passive sensor and active sensor. Passive sensor is a sensor that detects reflections orGEM emissions from natural sources. Active sensoris a sensor that detects GEM responses from objects emitted from energy sources artificial which is usually designed in a vehicle that carries a sensor. Based on length waves, sensors are divided into sensors visible (0.4 - 0.7) µm, infrared sensors (1 - 10) µm and microwave sensor (1 mm – 1 m).

Very important things related with sensors namely spectral characteristics and spatial characteristics. Spectral characteristics related to the width of the band. A sensor which has a smaller band width from other sensors, the sensor can said to have a spectral resolution higher. For example, Landsat TM sensorsband 1 (blue) has a long range wave (0.45 - 0.52) µm, while the sensor SeaWiFS in the blue band has a range between (0.402 - 0.422) µm, then the resolution SeaWiFS spectral sensors are higher than Landsat TM sensors Spatial characteristics related to Angular Field of View (AFOV) and Instantaneous Field of View (IFOV). AFOV (scanning angle) is a point of view maximum effective detecting sensor GEM. AFOV determines the broad sweep (swath width). IFOV is a point of view for a moment related to the sampling unit which determines the size of the image / pixel element or the smallest area that can be detected by sensor. The pixel size depends on IFOV and sensor height. For example, IFOV amounting to 2.5 millisradians, then the smallest area the sensor detected is 2.5 x 2.5 m at height of 1000 m.

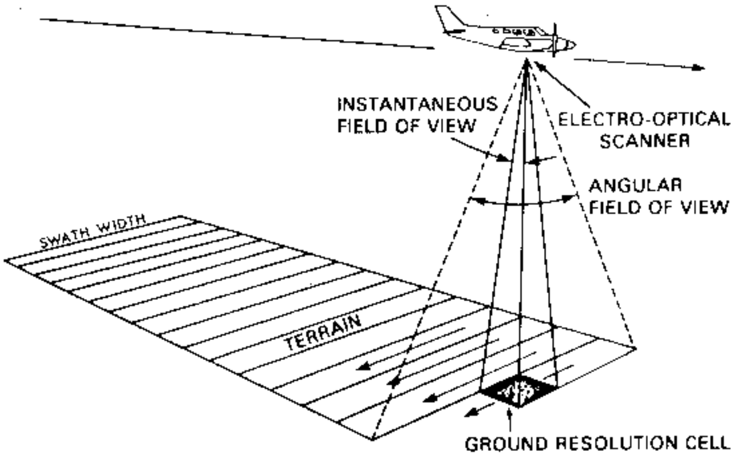

Figure 9. Concepts of AFOV and IFOV

I. REMOTE SENSING APPLICATION AWAY ON COAST AND SEA AREA

Some examples of application or analysis marine remote sensing technology on various purposes of observation and analysis at sea and coastal areas.

1. Detect potential fishing areas
2. Mapping sensitive ecosystem areas
3. Location feasibility for development, for example tourism and aquaculture
4. Mapping tsunami-prone areas
5. Monitoring the direction and speed of the typhoon on sea, and so on Here are some examples of applications remote sensing in coastal and oceanic fields:

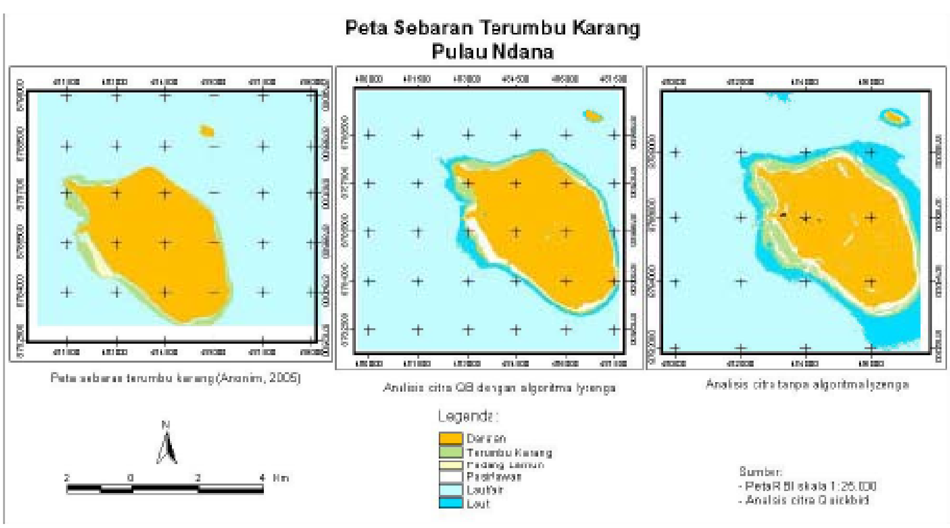

Figure 10. Map of Distribution of Coral Reefs Ndana Island

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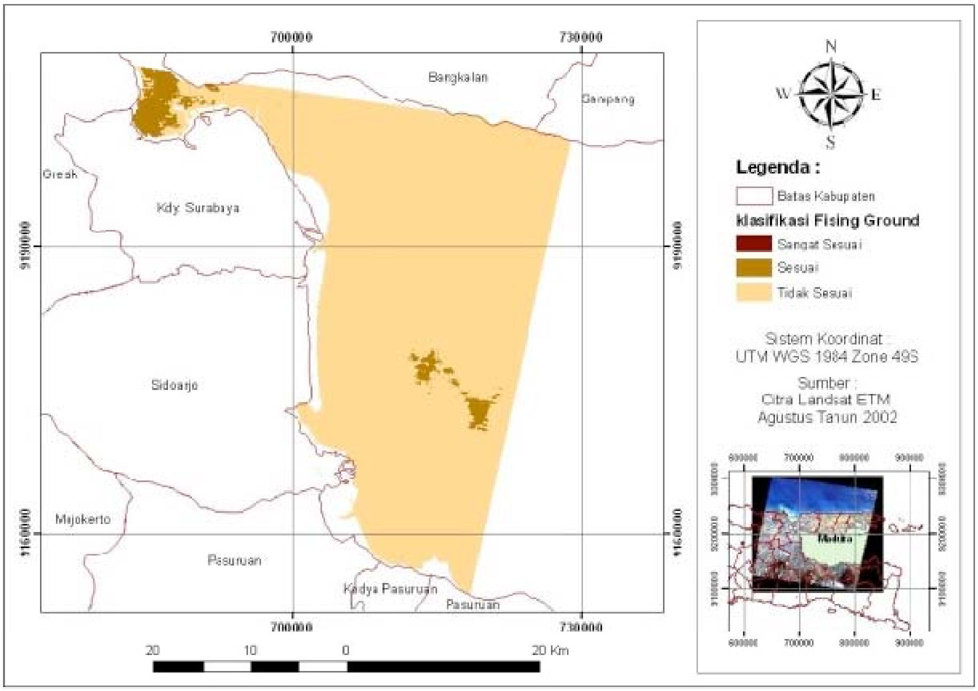

Figure 11. Map of Potential Catching Areas

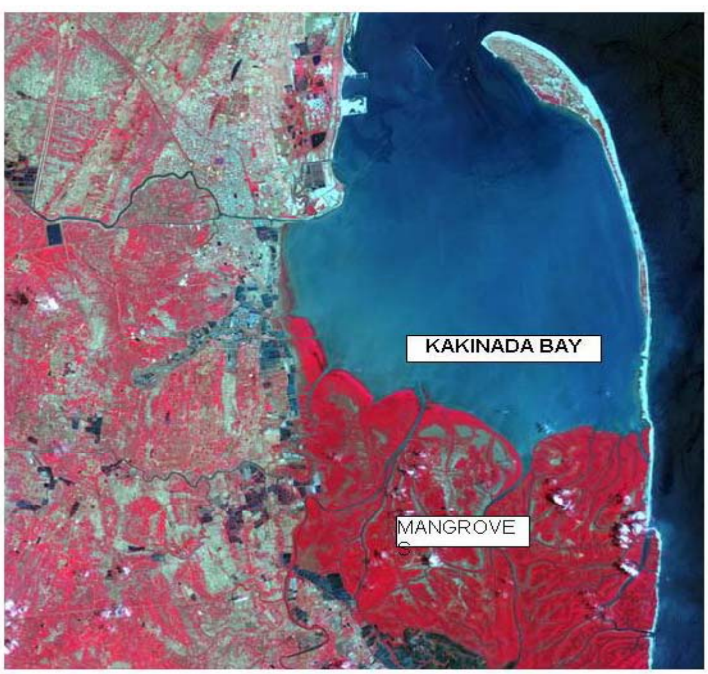

Figure 12. IRS 1D LISS III Coringa Mangroves Changes in Mangrove Areas from the Andaman Island

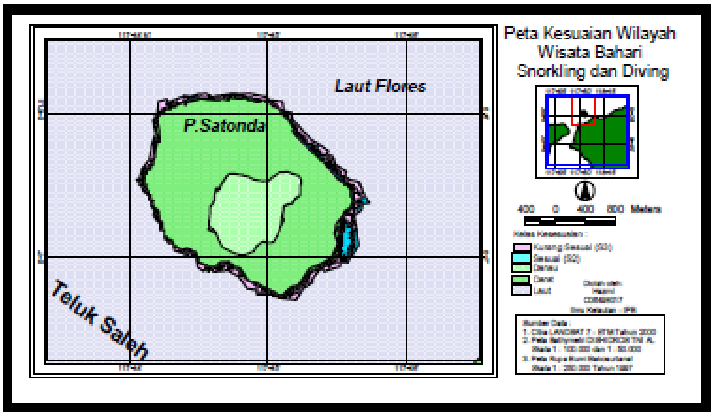

Figure 13. Tourism Area Suitability Map Marine Reefs (Snorkeling and Diving)

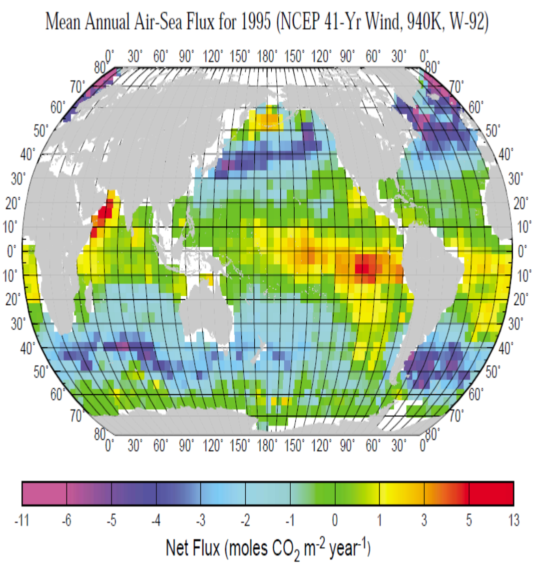

Figure 12.Changes in Global Ocean Carbon Dioxide (CO2)

Global Warming Isue:

1. Developing at a time when the consensus of international scientists states that climate warming on earth is a very real consequence of increasing carbon dioxide (CO2) and greenhouse gas emissions.
2. The oceans contain more than 50 times carbon compared to the atmosphere and the oceans are used as a buffer for the concentration of CO2 in the atmosphere.

The flux CO_2 (ΔpCO_2) in the oceans to their local red and yellow atmospheric CO_2 can be shown in the waters in the upwelling area.The effect of winter upwelling can be observed in western Pacific sub-artics and upwelling as the beginning of the southeastern season during July-August can be seen in the Persian Gulf.

DISASTER

Related to disaster remote sensing can be used to maping disaster events, such as landslides, tsunami, earthquakes, floods, bad nipples, storms

PERSONAL PROTECTIVE EQUIPMENT FOR WORK SAFETY

Protect themselves from disasters, personal protective equipment needed, such asplambing, helmet, swimsuit, coat mantel,

CONCLUSIONS

Marine / fisheries remote sensing can help various studies to understand dynamics of the coastal and marine environment including understanding resource dynamics nature contained in it, in particular related to fisheries.

DAFTAR PUSTAKA

Curran P. J. 1985. Principles of Remote Sensing. International Journal of Remote Sensing, Volume 6, Issue 11 November 1985 , page 1765.

Dahuri, R., J. Rais., S. P. Ginting., dan M. J. Sitepu. 2001. PengelolaanSumberdaya Wilayah PesisirdanLautansecaraTerpadu. PT. PradnyaParamita, Jakarta.

Efendy M., F. F. Muhsoni, H. Triajie., danA. F. Syah. 2009. Model AlgoritmaPendugaanKonsentrasiKlorofil-a Berdasarkan Data Citra SatelitLandsat TM untukPemetaanLokasi*Fishing Ground* di Selat Madura. LaporanPenelitian. UniversitasTrunojoyo.

Hazmi.2004. AplikasiSistemInformasiGeografis (Sig) danPenginderaanJauhDalamPenentuan Wilayah PotensialWisataBahariTerumbuKarang Di PulauSatonda, Dompu, Nusa Tenggara Barat.Skripsi.FakultasPerikanandanIlmuKelautan-IPB. Bogor (Tidakdipublikasikan)

JARS (Japan Association on Remote Sensing). 1993. Remote Sensing Note. Nihon Printing Co. L.td. Tokyo.

LAPAN.2003. TeknologiPenginderaanJauhdalamPengelolaan Wilayah PesisirdanLautan.PusatPengembanganPemanfaatandanTeknologiPenginderaanJauh, LAPAN, Jakarta Timur

Lillesand and Kiefer, (1979), Remote Sensing and Image Interpretation, John Wiley and Sons, New York.

Meaden, G.J. dan J. M Kapetsky. 1991.Geographical information system and Remote Sensing in Inland Fiheriesand Aquaculture. FAO Tech. Paper.No.318, FAO-the UN, Rome.

Parwati, E., T. Kartika, J. Indarto., F. Dyah., M. Nur., dan M. Kartasasmita. 2007. KajianHubungan Antara LajuPerubahan TSS (Total Suspended Solid) denganPenutup / PenggunaanLahan di Wilayah PesisirKabupatenBerau, Kalimantan Timur. Proceeding Geo-Marine Research Forum 2007

Robinson. I. S. 1985. Satellite Oceanography an Introduction for Oceanographer and remote Sensing Scientist.John Wiley & Son.

Rahadiati, A. dan S. Hartini. 2007. Pemanfaatan Citra Resolusi Tinggi UntukPemetaanSebaranTerumbuKarang Di Pulau Kecil. Proceeding Geo-Marine Research Forum 2007.

Suprakto, B. 2005.StudiTentangDinamika Mangrove KawasanPesisir Selatan KabupatenPamekasanProvinsiJawaTimurDengan Data PenginderaanJauh.MakalahpadaPertemuanIlmiahTahunan MAPIN XIV.InstitutTeknologiSepuluhNopember

Susilo, S. B. dan J. L. Gaol. 2008. Dasar-DasarPenginderaanJauhKelautan. DepartemenIlmudanTeknologiKelautan, FakultasPerikanandanIlmuKelautan, InstitutPertanian Bogor, Bogor.