COASTAL ENVIRONMENT MONITORING USING ADJACENT EFFECT OF RADIATION

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Abstract

KOMPSAT-2 was successively launched on July 28,06. She carries Fine Spatial Resolution Sensor with three channels. It is 4m monochromatic and 1m panchromatic. The main purposes would derive fine urban map and digital elevation model(DEM).Therefore we extend to coastal environment monitoring using the adjacent effect of radiation due to an interaction of radiation between heterogeneous surface and atmosphere.

With data analysis of ASTER on TERA, which is 15m resolution in visible and near infrared wavelengths, we found atmospheric aerosols were always large. Note that data analysis was limited in Nagoya bay, Lake Tahoe, California & La Pozuelos, La Picasa, Argentina. Thus this time we expect data analyses around isolated island and peninsula in west and south coast of Korea.

Key words: KOMPSAT, High Spatial Sensor, Coastal Environment, Adjacent Effect Heterogeneous surface

1. Introduction

When we come back from a cruise, we often observe a whitish umbrella covered the urban area due to atmospheric pollution. Big cities are located along bay areas or coastal zone. Therefore, there is a need to monitor atmospheric and surface optical environment from satellite. To do so, a sensor in a fine spatial resolution is to carry on satellites. Fortunately there is a recent trend to carry finer spatial resolution sensor on satellite. A satellite could measure interaction of radiation between urban area and atmosphere and between bay area and atmosphere. Therefore, the interaction depends upon atmospheric environment, as well as urban surface and coastal water conditions. This is called **adjacent effect of radiation**. Therefore this effect could contain information of urban area, coastal zone and atmospheric environment. Only requirement on satellite borne sensor should be fine spatial resolution. Fortunately KOMPSAT-2 carries a sensor of fine spatial resolution.

2. ASTER data analysis

So far with the coastal zone, a data analysis on ASTER on TERRA, some primal possibility were obtained, although her spatial resolution is 15m. This method can be extended to monitor vegetation environment in the coastal zone or peninsula.

When we scan data from land surface to ocean, the reflected radiation by land contaminates the radiation from ocean. This is called to adjacent effect of radiation. The adjacent effect of radiation depends upon the condition of reflectance difference between land and ocean as well as atmospheric condition together with wavelength of measurements.

The adjacency effect was discussed at coastal areas of main land and peninsula using VNIR and SWIR on ASTER sensor, although the cross-talk phenomenon is apparently noted on some SWIR. It was 15m spatial resolution for VNIR and 30m for SWIR. The purpose of the analysis is to derive optical characteristics of atmospheric aerosol. The aerosol model is in accordance to the dust-like model. This model is adopted to ASTER and MISR on Terra satellite. Data is the Atsumi Peninsula near Nagoya (34º40'N, 134º00'E), GMT1.55 on July 10,2000.To scan coastal zone, peninsula in different dimensions or isolated island, surface would be composed of vegetation and soil, whereas in the atmosphere, aerosols of different characteristics and cloud formation would exist. Once feasibility study is promising, we should spend our effort to ground truth.

Table Adjacent Effect and Cross Talk of Land Surface on Coastal Water
Center wavelengthλ (μ m).
Atsumi Peninsula near Nagoya (34º40'N, 134º00'E), GMT1.55 on July 10, 2000

	chn	λ (μ m)	Mainland	Peninsula(N/S)
VNIR	1	0.56	2.6km	180m/200m
	2	0.66	2.6km	135m/200m
	3N	0.81	2.5km	135m/200m
SWIR	4	1.65	3.27km	330m/330m
	5	2.165	3.57km	**6.96km/8.19km**
	9	2.395	3.54km	360m/**1.86km**
SWIR	**6**	2.205	2.7km	270m/450m
	7	2.26	2.6km	180m/210m
	8	2.33	2.3km	180m/270m

Note that the distance between the Japan main land and the peninsula is **11.22km** (374 pixels) and the peninsula width is **4.2km**(140 pixels). It shows the distance between the coastal zone and the point of the level asymptotically converged on the ocean.

(1) **The Japan Main land** indicates 6~20 times more effect than the peninsula on adjacent radiance from

ocean water due to contribution of land area. It is large off the main land, whereas it is small off peninsula.

(2) The effect is **asymmetry** at the peninsula (N,S). The south side indicates stronger effect than the north side. This might be due to surface characteristics.

(3) Adjacent effect is similar to all channels 1,2& 3N on VNIR. VNIR < SWIR.

(4) SWIR & VNIR indicates similar adjacent effect. This might be due to aerosol **of large particles** in the atmosphere.

(5) SWIR channel **5** indicates cross talk when crosses peninsula, but it is asymmetry.

(6) SWIR channel **9** indicates cross talk at the south crossing. Why it does not at the north crossing?

(7) SWIR 4,5 & 9 indicate strong effect on radiance from the ocean. Average adjacent effect over chs. 6,7 & 8 is 2.53km, whereas it is 3.46km (37% up) over chs. 4,5 & 9.

(8) Adjacent effect of ch.5 on SWIR off Peninsula is unusually strong. It is 6.96km(N) & 8.19km(S).

(9) Adjacent effect of ch.9 on SWIR off Peninsula is asymmetry. It is 360m on north side, whereas it is 1.86km on south side.

3. KOMPSAT-2 data analyses

There are a lot of islands in the west and south coast of Korea. Their dimensions are different. Some are large and some are small. The adjacent effect depends upon the island dimension as well as its reflectivity and homogeneity. We plan to examine north to south, west to east directions, if it is an island with multiple wavelengths

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