# *A feasibility study on detection of the wide-area crustal movement in Kyushu area by DInSAR using ALOS/PALSAR data*

**Nobuhiro Tomiyama**(1), **Katsuaki Koike**(2), **Makoto Omura**(3)

(1) RESTEC, 1-9-9 Roppongi, Minato-ku, Tokyo, 106-0032, JAPAN, E-mail: tomiyama@restec.or.jp
(2) Kumamoto Univ., 2-39-1 Kurokami, Kumamoto-shi, Kumamoto, 860-8555, JAPAN, E-mail: koike@gpo.kumamoto-u.ac.jp
(3) Kochi Women's Univ., 5-15 Eikokuji, Kochi-shi, Kochi, 780-8515, JAPAN, E-mail: omura@cc.kochi-wu.ac.jp

***Abstract***
The DInSAR is the powerful technique to measure the geomorphic changes at a time. Usually the target of DInSAR measurement is the local crustal movement in one scene[1]. It is very rare to detect the long-term crustal movement in wide area. We had challenged to detect the deformation with connecting 5 path's interferograms in all Kyushu mainland using JERS-1/SAR data, and found its possibility. In this study, we take similar approach for ALOS/PALSAR data. As a result of the study in this step, the interferograms in all paths are acquired with high coherent.

***Keywords:*** JERS-1, L-band, coherence.

## 1. INTRODUCTION

The objective of this study is to examine the possibility of application of Differential Interferometry of Synthetic Aperture Radar (DInSAR) technique using ALOS/PALSAR data for the analysis of the wide-area and long-term crustal deformation.
The area covered by one scene of PALSAR with FBS or FBD mode is too narrow for covering wide-area over than a few hundred-kilo meters in width. This study discusses the detection of the wide-area crustal movement in Kyushu area by DInSAR using ALOS/PALSAR data. As the result of previous study using JERS-1/SAR, the differential interferograms in 5 paths around Kyushu main land could be connected.

## 2. TARGETAREA

There are many active volcanoes and active faults over Kyushu (Figure 1), which is the southwest island in Japan. The stress fields in Kyushu tend to be developed the normal faults. These crustal features are different from those of other region in Japan. Kyusyu is rich in the geothermal resources and there are many hot springs and some geothermal power plants. The applications and developments of these geothermal resources cause of local ground movements. Additionally, the natural hazards accompanied with geomorphic changes like landslides and debris flows occur at many places in Kyushu region. In order to learn the critical tendency of the crustal deformations in Kyushu, it is needed to investigate the amount of the geomorphic changes all over this area widely.

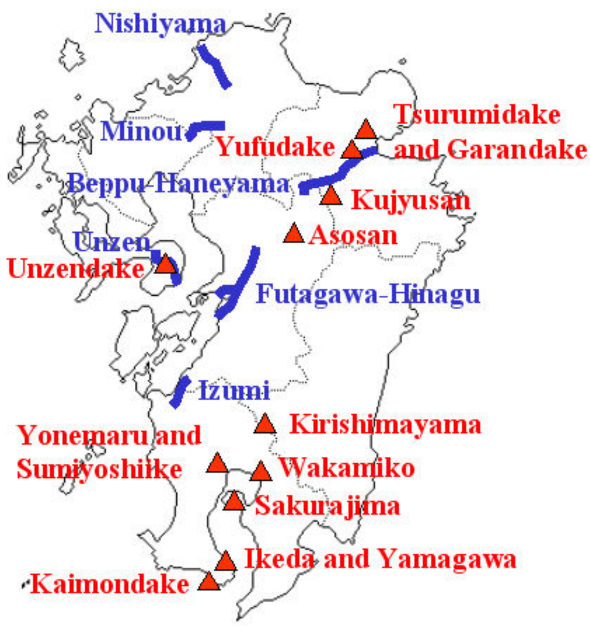


*Figure 1. Main volcanoes and faults in Kyushu mainland*

## 3. CONCERNED STUDY USING JERS-1 DATA

As a previous study, we approached the wide-area change detection using JERSJERS-1/SAR and developed the possibility for the connection of interferograms on continuous several paths[2]. JERS-1/SAR was adopted L band and had been observing the earth surfaces for about 6 years, since 1992 to 1998. It could observe next west path on the next day so that the time-difference between continuous two paths is only one day. Therefore it can be make interferograms with very short time difference (5days) using data which were observed in continuous 5 days. Figure 2 shows the connecting interferograms between Jan. 1998 and Aug. 1998.

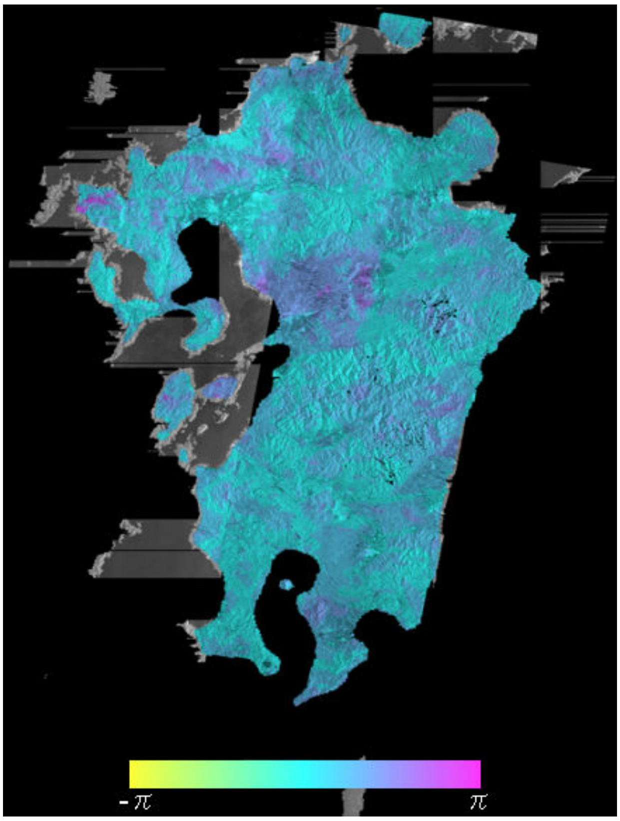


*Figure 2. Connected interferograms of JERS-1/SAR*

## 4. ALOS/PALSAR DATA ANALYSIS

An important difference of condition between JERS-1/SAR and ALOS/PALSAR is the time-difference of continuous two paths. This difference of PALSAR is 17 days and the total time-difference for all Kyushu area (4 paths) is at least 46 days. It is one item to be concerned how affected these intervals for the connections of interferograms.

We have started the analysis using PALSAR data. Table 1 shows the list of data-pair for. Bpara and Bperp (parallel and perpendicular components of baseline) are calculated by CalcBp_win_21 software produced by JAXA. Every temporal difference between master and slave data are 96 days. Figure 3 shows the coherence and interferogram after removing orbital and terrain fringes in path no. 423. This interferogram have relatively high coherence but an orbital-error compornent was remained.

*Table 1. DInSAR data-pair (FBD) for an initial analysis*

| ***Path*** | 425 | 424 | 423 | 422 |
|---|---|---|---|---|
| ***Master*** | 14-Jun-07 | 27-Jun-07 | 10-Jun-07 | 09-Jul-07 |
| ***Slave*** | 14-Oct-07 | 27-Sep-07 | 10-Sep-07 | 09-Oct-07 |
| ***Bpara(m)*** | 259.74 | 168.4 | 259.74 | 376.99 |
| ***Bperp(m)*** | 583.07 | 138.6 | 583.07 | 330.9 |

## 5. SUMMARY AND FUTURE PLAN

We have detected interferograms of each path in Table 1. At present, our primal task is to improve our connecting method for PALSAR data and to connect each interferogram actually. The wide-area crustal deformation is slow and long-term deformation so that it is suitable to use a long-term data pair. But PALSAR has not yet prepared long-term data-pair because it started the steady observation since Oct. 2006. As a plan in 2008, we will wait for a few observing cycles and then approach the long-term DInSAR analysis.

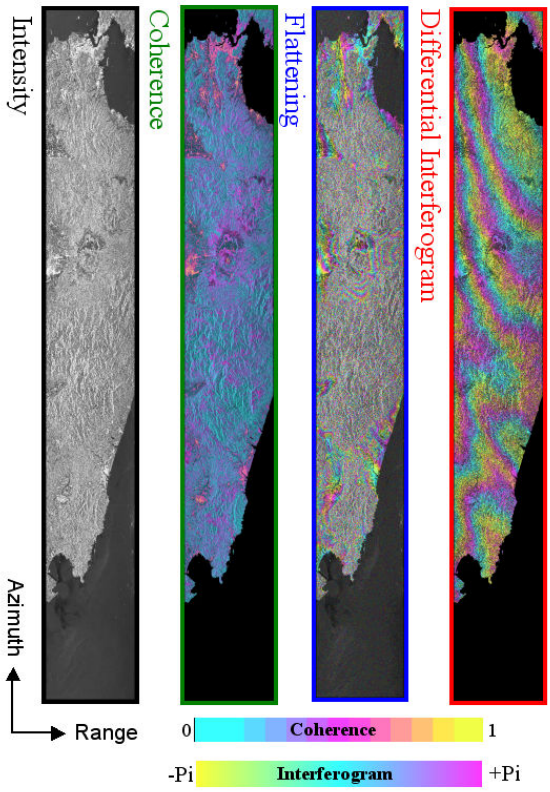


*Figure 3. Sample analysis of ALOS/PALSAR (Path:423)*

**Sample acknowledgement**

This research is conducted under the agreement of JAXA Research Announcement titled ‘A feasibility study on detection of the wide-area crustal movement in Kyushu area by DInSAR using ALOS/PALSAR data’ (JAXA-PI number: 421).

**Sample References**

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