

GPS and Forestry in Japan

Up to 70% of land in Japan is covered by forest. Since the second world war many forests have been planted with cedar and nurtured for their high productivity. However, forests are valued not only for timber production but also for water-resource management and hazard prevention, such as that involved in landslide. Conservation and forest management today play a key role in environmental protection.

New Maps Needed

The Japanese Ministry of Agriculture, Forestry and Fisheries and the Forestry Agency promote forestry management using GIS, but the creation of the 'Forest Base Map' in digital format is for many reasons going very slowly. Firstly, forest maps are traditionally drawn on polyester sheets at scale 1:5,000 and the resulting large stockpiles of analogue sheets thus need vectorising to get them into computer-accessible format. Secondly, in 2000 the geodetic datum of Japan was changed to the global one, that is GRS80 from Bessel. Since land use and built-up areas may have changed considerably in some areas, the content of the analogue maps is outdated and a cycle of revision is required. In addition, the scale of 1:5,000 is too small to work with in practice, while these maps do not well match other basic maps, such as the National Base Map and Forest Register Map. All these issues demand the urgent production of new and precise maps.

Ground Survey

The conventional Forest Base Map was produced by aerial photogrammetry. Although direct orientation by GPS/IMU aerial camera systems has dramatically reduced control-point survey work on the ground, ground surveys are still indispensable since the forest floor cannot be seen from the air. The Traditional ground survey by plane table surveying has been replaced by CAD-controlled total-station survey, which enables direct recording of data in digital format. GPS might further improve ground surveys, and DGPS has already been used countrywide, but attenuated transmission may reduce its effectiveness. This problem is being solved by a SBAS (Satellite based Augmentation System), which transmits correction signals via stationary satellites.

Experiments

To date more than 1,200 Electric Control Points (ECP) have already been positioned across the country, including in mountainous areas, at intervals of 40-50km, and their authorised coordinates are open to the public. GPS data is also distributed to users at a charge. Hence application of DGPS and network-based GPS (FKP, VRS) to forest surveying would be a big breakthrough. Fortunately, the Department of Forest Science at Shinsyu University in central Japan recently released a promising report on some surveying experiments conducted in typical forests, in which practically precise observations were obtained with FKP and SBAS-DGPS using ECPs. Of course, more experiments must be carried out to ascertain their practicability.