Seasonal effects in 630nm airglow patterns and their dynamics observed in the dip-equator region of eastern Asian, Vietnam

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An all-sky imager to observe 630nm airglow was first installed in the dip-equator region of eastern Asia near by Ho Chi Minh City in the southern Vietnam and has been regularly operated for every new-moon period of two weeks since February 18 2001. We will report on remarkable seasonal effects of equatorial airglow patterns and its dynamics that have been registered during one year. They include several unique features in addition to those generally consistent with previously reported results such as from the eastern and western South American dip-equator regions. Typical features are as follows; 1) Airglow intensity is observed enhanced around midnight in most of clear sky days. 2) Airglow zones observed in evening near the southern and northern horizons in about 1000km are gradually increased in elevation angle and come closest the dip equator around the midnight, which is typical in the equinox months. 3) Dark regions of striation structures extending over 1000km from north to south and are found stably drifting eastward with a velocity typically of 150m/s and of 80m/s, according to early or late in night, which is a feature corresponding to plasma bubbles and is preferentially observed in equinox months. 4) Simultaneous enhancements both of the southern and northern airglow regions are typical in the equinox months. 5) It is observed that an airglow zone in the southern or northern sides of the dip-equator is more enhanced in May or in December, respectively. 6) High-speed traveling enhancement zone from the south to the northern horizon are observed in July. Their speed reaches as much as 300m/s. 7) A case in which depletion structures drifting westward by 140m/s after midnight was found in December. 8) Typical bubble structures are found under quiet conditions of geomagnetic activity. The facts of 1) and 2) are reasonable to consider that oxygen ions produced in the equatorial anomaly region are transported downward and are enhanced in recombination process due to control of the westward electric field in the F-layer ionosphere in night time. Seasonal effects of airglow zones in 4) and 5) can be explained by difference of ion-drag effect, that is, neutral wind blow from the opposite hemisphere drag and decrease ions along the magnetic lines of force and cause to enhance recombination during solstice seasons.