

near real-time for inspection. A map indicating the sampling transects for E-Flux II is shown in Fig. 8, and Table 2 presents the start and end times of each of the transects. The first mapping section, Transect 1, was nearly coincident with the transect that passed through the center of the mature eddy (Cyclone *Noah*) studied in detail during E-Flux I. Transect 1 began on January 10 at 20.30°N, 156.50°W and extended southward along 156.50°W to 18.70°N. The spacing between stations was 37 km (~20 nmi) and the time interval between individual CTD casts was about 3 h. No mesoscale features were discovered during Transect 1.

R/V *Wecoma* then began a transect northward (called Transect 2) along longitude 157.00°W (about 55.6-km to the west of Transect 1) from latitudes 18.00°N and 20.30°N, respectively. ADCP data continued to be collected nearly continuously. CTD data were again obtained every 37 km or 20 nmi at 3-h intervals. At this point (January 12), no major mesoscale eddy features were apparent from our data, so Transect 3 was made from the lee side of Maui and Hawai'i (19.30°N, 157.50°W) through

the 'Alenuihaha Channel (to 20.70°N, 155.50°W), which separates the two islands. Again, the region lying just to the southwest of the Channel has been documented to be a location where mesoscale eddies are often initiated. Thus, Transect 3 was considered important to determine if sub-mesoscale or mesoscale eddies might be present and also to characterize the physical and bio-optical structures and currents of the 'Alenuihaha Channel and neighboring waters. Transect 3 was selected to be sampled for a multiplicity of biological and biogeochemical variables (i.e. a so-called "money run"). The spacing between CTD stations for this transect was reduced to 18.5 km in order to resolve better any features that might be present. Later transects were made in search of mesoscale or even submesoscale features. Data collected during a second money run, Transect 4, are displayed in Fig. 9. Despite all attempts to discern eddy features from hydrographic and satellite data, no obvious features were evident. ADCP data are shown in Fig. 10. The currents are generally quite weak and no clear indications of mesoscale features are evident. Perhaps the most important result of E-Flux II is the lack of a major mesoscale feature or any major spatial biological or biogeochemical anomalies in the absence of trade wind conditions.

3.4. E-Flux III

Strong northeasterly trade winds returned to the southwest of the 'Alenuihaha Channel within a week of the completion of the E-Flux II cruise as indicated in Fig. 1 and produced a cold-core, cyclonic eddy called Cyclone *Opal* (Figs. 11A–C). Except for about 10 days in very late February through early March 2005, the trade winds persisted from the beginning of the E-Flux III cruise until near the end of April 2005. In particular, winds reached over 20 m s⁻¹ during the first few days of the E-Flux III cruise, so that CTD sampling along Transect 1 (Table 3 and Figs. 12A and C) had to be curtailed because of the sea state. Thus, Transect 1 included only four CTD stations, but ADCP data were collected completely across it (see Table 3). During the remainder of the cruise, the winds were less than about 11 m s⁻¹ for the most part, with a notable exception being a period when northwesterly winds ranged from 11 m s⁻¹ to over 17 m s⁻¹ (~20 to over 30 knots) around March 16.

Cyclone *Opal* became visible in satellite SST (MODIS and GOES) imagery at approximately 20.00°N, 156.30°W to the southwest of the 'Alenuihaha Channel between about February 18 and 25 (Fig. 11B), but may have formed at least 1–2 weeks earlier. The genesis of Cyclone *Opal* was likely quite similar to that of Cyclone *Noah*, which formed at a location fairly close to *Noah*'s apparent origination position. Again, accelerated winds through the 'Alenuihaha Channel likely forced the eddy genesis. Lower wind speeds and warm-water "wakes" are apparent in the downwind shadows of Maui and Hawai'i, with cooler waters lying to the southwest of the 'Alenuihaha Channel

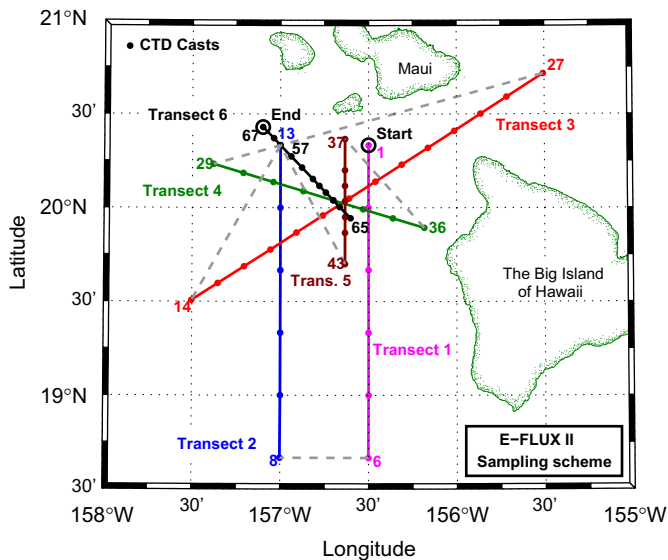


Fig. 8. Sampling map for E-Flux II.

Table 2
Dates and times (Hawaii Standard Time, local time) of the beginning and end of R/V *Wecoma* sampling operations during transects (see Fig. 8) for E-Flux II

Operation	Beginning date (2005)	Beginning time (HST)	Ending date (2005)	Ending time (HST)
Transect 1	Jan. 10	1800	Jan. 11	0900
Transect 2	Jan. 11	1826	Jan. 12	0855
Transect 3*	Jan. 12	1520	Jan. 14	0640
Transect 4	Jan. 14	1800	Jan. 15	0747
Transect 5	Jan. 15	1145	Jan. 15	2026
Transect 6*	Jan. 18	0840	Jan. 19	1815

*Indicates the so-called "money run" transects which were the most intensively (more variables) sampled transects of the cruise.