is observed. On synoptic time scales, geopositioning of the fronts may be systematically identified through surface outcropping of diagnostic thermohaline isopleths and are therefore readily discerned from both shipboard surveys and by spaceborne satellite sensors. The NSTF during winter-spring can be characterized by surface outcropping of the 34.8 isohaline and the 17C isotherm within the frontal gradient. Biologically, the NSTF marks the transition from low chlorophyll, nutrient depleted surface waters to the south to a more productive regime to the north. To the south, the 21C and 35.0 surface isotherm and isohaline, respectively, are characteristically embedded in the thermohaline gradients associated with the SSTF. A sharp increase in total chlorophyll is also observed at the SSTF and is ascribed to an increase in the concentration and thickness of the subsurface chlorophyll maximum (Chl-max) prompted by the shoaling of the nutricline with the thermocline structure into the euphotic zone. Finally, the presence and position of the NSTF and SSTF seem to play a key role with regards to distribution patterns observed among higher trophic levels. Albacore tuna, (*Thunnus alalunga*), swordfish (*Xiphias gladius*), squid (*Ommastrephes bartramii*), and loggerhead sea turtles (*Carctta caretta*) all exhibit strong affinities for waters associated with these fronts.

OS42H-09 1645h

Mesoscale Chlorophyll Variations in the North Pacific Subtropical Gyre: An El Nino/La Nina Comparison

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Springtime composites of surface chlorophyll (chl) derived from SeaWiFS imagery show an elevated region of chl (on the order of 0.2 mg m^{-3}) north of 30°N in the eastern North Pacific gyre. To investigate this feature, multi-platform surveys of 158°W from 23°N to 33°N were conducted in both 1998 (El Nino) and 1999 (La Nina) to characterize the hydrographic conditions associated with this ocean color anomaly. Shipboard measurements of fluorometric chl, HPLC pigments, temperature, conductivity, and oxygen were performed. Sea surface topography and chl concentrations were monitored using TOPEX/Poseidon and SeaWiFS imagery, respectively, and estimates of primary production were computed using a full-spectral depth-dependant model using in situ or satellite chl as input. In both years, the southern portion of the transect resembled the climatological conditions at Station ALOHA (22.75°N, 158°W) with relatively high SSTs and a subsurface chl maximum located at approximately 120 m depth. During El Nino, a shoaling of the thermocline and deep chl maximum was observed at a subsurface front located at 28°N. Surface chl concentrations, however, did not change significantly along the transect until the Subtropical Front was encountered at 32°N. In contrast, during the La Nina cruise, the subsurface front was located much further north at 32°N and the Subtropical Front was not sampled because it was north of the northern edge of the 33°N transect. The greatest contrast between the two transects in surface and integrated chl, along with estimated primary production, was noted in the northern section of the transect (32-33°N). All the physical and biological features, including regions of higher primary productivity, were shifted northward during La Nina. Finally, comparison of primary production model output using in situ and satellite data demonstrates the need for an additional parameter, possibly sea level height, when estimating primary production using ocean color data.

OS42I CC: 214A Thursday 1330h

Coastal Ocean Dynamics and Prediction VI

Presiding: **D B Haidvogel**, Rutgers University; **R M Samelson**, Oregon State University

OS42I-01 1330h INVITED

Ocean Model Data Assimilation

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We discuss ocean model data assimilation and examine the impacts of its applications in three ocean models running at the Environmental Modeling Center. The methods used for data ingestion by these models are described and comparisons made between model-nowcast-temperature fields and observations from moored buoys and BTs in the Northwest Atlantic.

The three models are as follows:

(1) The NCEP adaptation of GFDL's modular ocean model to the Atlantic Basin, primarily for climate forecasting (referred to as "AOM", for Atlantic Ocean Model); (2) The NCEP adaptation of the Princeton Ocean Model, for regional nowcasting and short-term forecasting (known as "COFS", for Coastal Ocean Forecast System); (3) A new experimental ocean forecasting system, with regional and global versions, created by D. Chalikov ("Regional-CM" and "Global-CM", for the Chalikov models).

The AOM uses a technique for assimilation of ocean data developed by Derber and Rosati (1989), with a wide data- window centered on the validation date, and corresponding to its longer term forecast objective. The COFS algorithm for assimilation of surface temperature data was designed after the scheme used in the AOM, with a more narrow data window which ends at nowcast time, and a mixed-layer temperature correction. The Chalikov Regional and Global models presently ingest the analyzed temperature fields of the Navy's Optimal Thermal Interpolation System (OTIS).

Comparative evaluations of the outputs of these models are made in two ways. Time series plots of sea surface temperature records from the moored buoys of the Northwest Atlantic are compared with time series of collocated model output SSTs. Temperature sounding records from BTs dropped in the region by commercial, research, and Coast Guard and Navy ships, are compared with collocated "virtual soundings" created from the multi-level model output files.

Together, the results of the comparisons show that both the construction of the analysis algorithm and the timeliness of the data relative to the forecast objective have significant impact on agreement with observed temperatures.

OS42I-02 1345h INVITED

Estimating the Circulation of Coastal and Estuarine Systems

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The NOPP funded Coastal Marine Demonstration of Forecast Information to Mariners for the U.S. East Coast (CMDP) is generating nowcasts and forecasts for the coastal ocean of the Mid-Atlantic Bight and the Chesapeake Bay.

Within Chesapeake Bay water level has been estimated using the Chesapeake Bay Estuarine Forecast System (CBEFS). These estimates have been made using the barotropic version of the MECCA model forced at the open boundary near the mouth of the Bay with water level from a nearby NOS tide gauge. The wind stress forcing of the estuary is estimated by either the RAMS or ETA32 model. The RAMS model provides fine resolution wind fields that capture important features of the coastal wind field. We believe that such models will be critical to improving our estimates of coastal and estuarine circulation whether for simulation or assimilation.

This approach has successfully estimated water level within, but there are events that are not well represented. In these cases, water level estimates have significant differences from the tide gauge measurements. To address this, the representer method has been applied to assimilate the data within Chesapeake Bay. This technique provides estimates of sea level at the mouth of the Bay. This boundary condition, forcing with wind stress derived from the RAMS model and the dynamics of a linear shallow water model provides estimates of water level throughout the Bay. Forecasting is accomplished by using RAMS forecasts of wind and persisting the difference of water level from the tidal estimate. Results of identical-twin experiments and hindcast experiments are presented and characterized.

URL: http://cmdp.wsicorp.com/

OS42I-03 1400h

Interaction of Buoyancy Inputs and Local Wind in the Control of Stratification on the North Carolina Inner Shelf

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The inner shelf off of Duck, North Carolina is subject to highly variable influence from the outflow of Chesapeake Bay, approximately 100 km to the north. Field observations during a Coastal Ocean Processes (CoOP) study in late summer and early autumn have been used to investigate the combined effects of the pulsed arrivals of buoyancy input and the local wind on the stratification and stability of water over the inner shelf. Complementary perspectives were provided by repeated shipboard surveys and an array of moored instrumentation. Variability of stratification with time and with distance offshore was investigated with an integral measure of stratification, the potential energy (PE) anomaly, which compares the PE of the observed, stratified water column to the PE it would have if it were well mixed. In order to quantify the separate influence of temperature and salinity on the density stratification, a modification to the PE anomaly was introduced which separates the relative contribution of thermal and haline vertical structure to the density stratification. This showed that in August, stratification within 10 km of the coast was controlled primarily by salinity whereas at distances greater than 15 km thermal influence was usually dominant. However, a significant departure from this pattern was observed when upwelling-favorable winds persisting for several days transported low-salinity surface water offshore, resulting in salinity-dominated stratification at distances well beyond 15 km. Vertical variations of stratification and stability within the water column were investigated through estimates of buoyancy frequency and gradient Richardson number. Under downwelling winds, stratification and velocity shear appeared to be concentrated within a well-defined interfacial layer at mid depth, with weak stability indicated by Richardson number estimates. Under upwelling winds a greater variety of spatial patterns was observed. Redistribution of buoyancy inputs from the Bay by wind-induced straining played a major role in controlling summer stratification at this inner shelf site.

OS42I-04 1415h

The Upstream Spreading of Buoyant Coastal Discharge

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