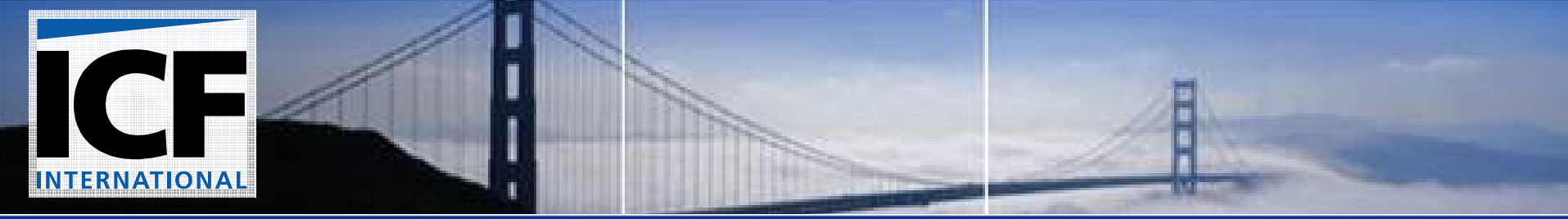

Five-Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico

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Presented at the 25th Information Transfer Meeting
OCS Region of the Minerals Management Service

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New Orleans, Louisiana

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Presentation Outline

- Background & Objective
- Project Overview
- Dataset Contents
- Summary Characteristics for the 5-Year Period
- Expected Uses of the Dataset
- How to Obtain the 5-Year Data

Background & Objective

- Dispersion modeling is an accepted method for assessing the effects of OCS emissions on air quality in the Gulf of Mexico (GOM) region
- Dispersion models (e.g., CALMET/CALPUFF, OCD5) are run for annual or multi-year periods and require multi-year meteorological datasets that span one or more years

Background & Objective

- Objective of this study was to prepare a 5-year meteorological dataset for the GOM region that
  - Represents a recent baseline period
  - Includes data from current onshore & offshore sources
  - Will support air quality modeling applications for a variety of environmental assessments

MMS 5-Year Dataset Considerations

- Compatibility with prior dataset for 2003
- Avoid unusual meteorological conditions associated with GOM hurricane activity during 2005
- Suitability for use with CALMET/ CALPUFF & OCD5 modeling systems
- Consistency and quality of data (and model output files) from a variety sources

MMS 5-Year Dataset Period & Domain

Period: 2000–2004 (avoids hurricane activity during 2005)

MMS 5-Year Dataset Contents

- Model output from the Rapid Update Cycle (RUC) dynamic meteorological model – formatted as 50 tiles covering the GOM & nearby onshore areas
- National Weather Service (NWS) surface meteorological data (230 stations in the GOM region)
- NWS upper-air meteorological data (21 stations in the GOM region)
- NDBC buoy data (~13 stations)

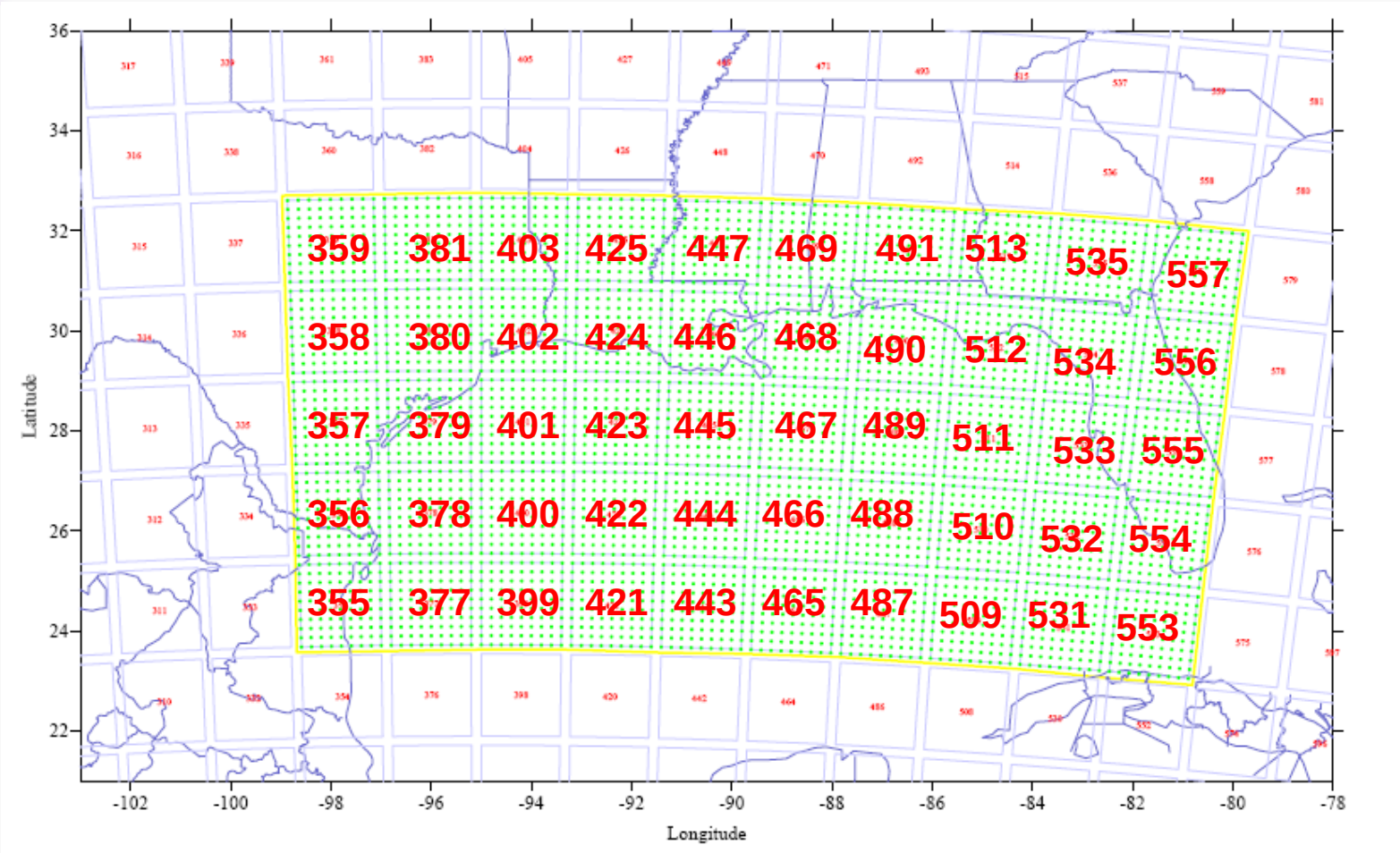
MMS 5-Year Dataset Contents (concluded)

- NWS precipitation data (~270 stations in the GOM region)
- AIRS/AQS ozone data (~200 monitoring sites)

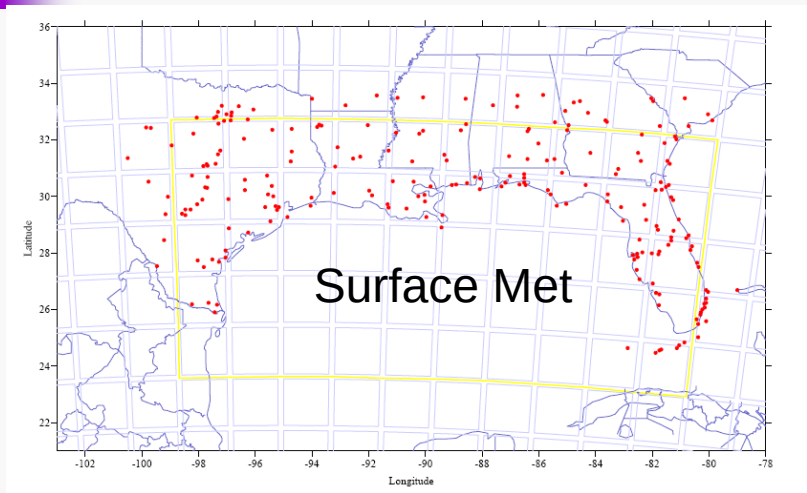
RUC-Derived Meteorological Fields

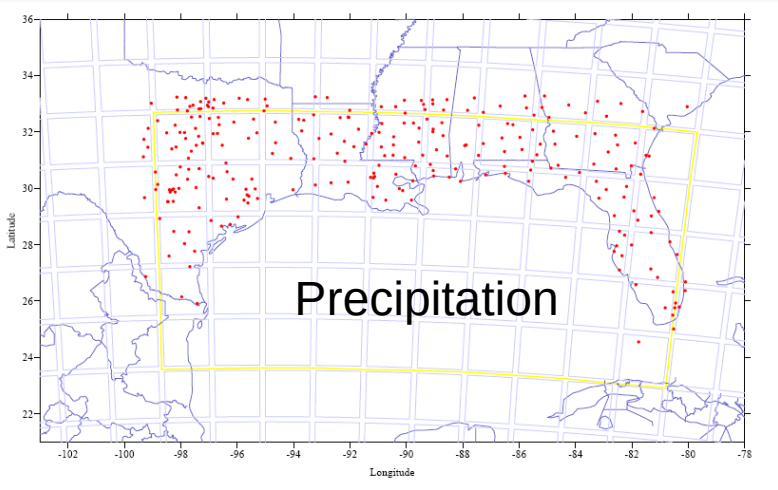
- RUC output files for the GOM region extracted from the output files for the full (continental-scale) RUC domain
- For ease of use, subset output files prepared for 50 “tiles,” each covering a portion of the GOM region (formatted for use in CALMET)
- Early fields interpolated to 20-km horizontal resolution. RUC outputs are:
  - 40-km resolution for 2000–April 2002
  - 20-km resolution for April 2002–2004

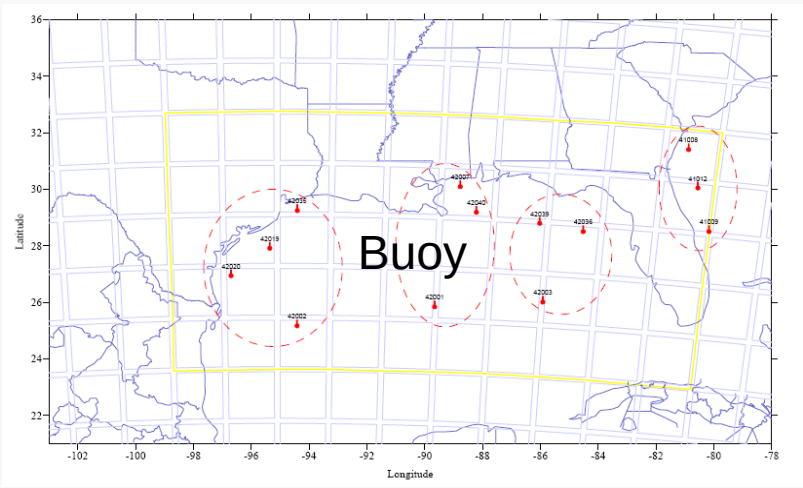
MMS 5-Year Dataset Domain w/RUC Tiles

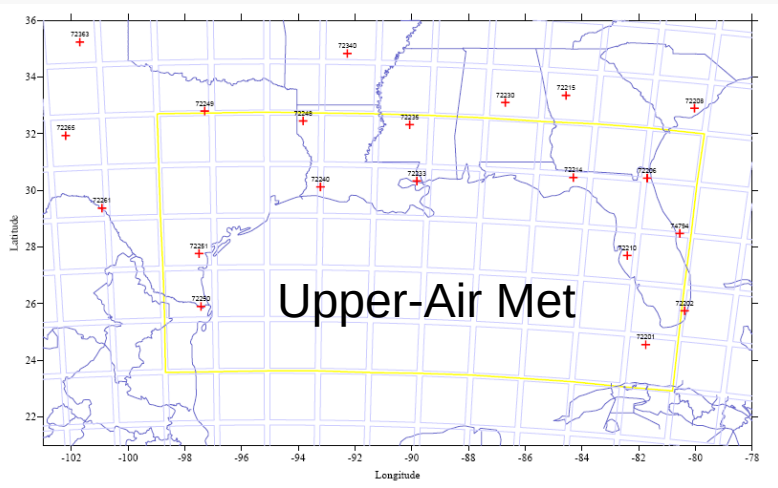


NWS/NDBC Meteorological Data for CALMET: Site Locations



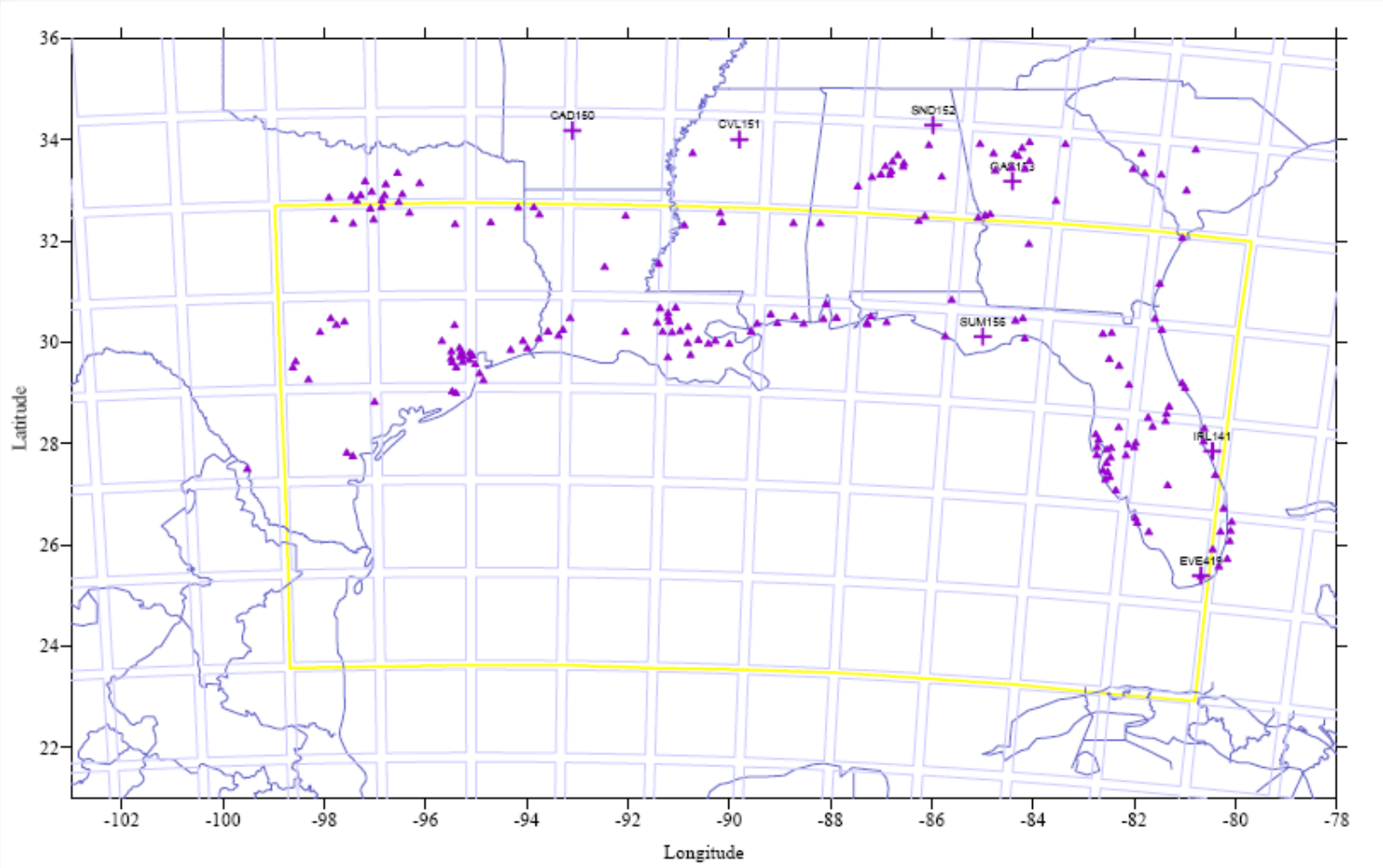






Source: Earth Tech 2006

AQS Ozone Data for CALPUFF: Site Locations



Source: Earth Tech 2006

OCD5 Model Inputs

- Met inputs for OCD5 used to characterize
  - Over-water boundary layer
  - Over-water transport & dispersion
  - Transition to over-land dispersion
- Inputs developed for site groups consisting of
  - Buoy
  - On-shore surface met site
  - On-shore upper-air met site
- Mixing height estimates were provided by the National Climatic Data Center (NCDC)

OCD5 Site Groups and Areas of Interest

- **OCD Group 1**: (southwestern Texas coast)
  Buoy 42020; Surface & upper-air: Corpus Christi
- **OCD Group 2:** (central Texas coast)
  Buoy 42019; Surface & upper-air: Corpus Christi
- **OCD Group 3a**: (northeastern Texas coast)
  Buoy 42035; Surface: Port Arthur; Upper-air: Lake Charles
- **OCD Group 3b:** (western Louisiana coast, specifically Cameron and Vermillion Parishes)
  Buoy 42035; Surface & upper-air data: Lake Charles
- **OCD Group 3c:** (central Louisiana coast)
  Buoy 42035; Surface: Patterson; Upper-air: Lake Charles

OCD5 Site Groups and Areas of Interest (continued)

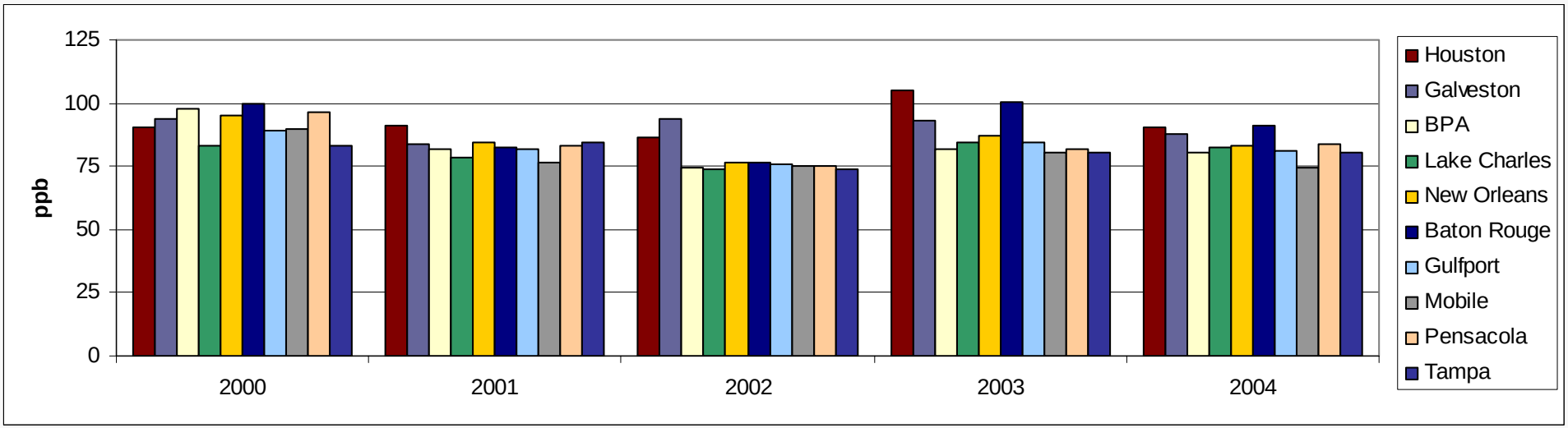
- **OCD Group 4a:** (north of Pass a Loutre, LA to Biloxi, MS) Buoy 42007 ; Surface: New Orleans; Upper-air: Slidell
- **OCD Group 4b:** (east of Biloxi, Mississippi and Alabama) Buoy 42007; Surface: Mobile; Upper-air: Slidell
- **OCD Group 5a:** (east of Morgan City to Pass a Loutre, LA) Buoy 42040; Surface: Patterson; Upper-air: Slidell
- **OCD Group 5b:** (Florida panhandle, west of Destin) Buoy 42040; Surface: Pensacola; Upper-air: Tallahassee

OCD5 Site Groups and Areas of Interest (concluded)

- **OCD Group 6a:** (Florida panhandle, Destin-Panama City)
  Buoy 42039; Surface: Panama City; Upper-air: Tallahassee
- **OCD Group 6b:** (Florida panhandle, east of Panama City)
  Buoy 42039; Surface & upper-air: Tallahassee
- **OCD Group 7a**: (Florida panhandle, east of Panama City and northern peninsular Florida)
  Buoy 42036; Surface & upper-air: Tallahassee
- **OCD Group 7b**: (central peninsular Florida)
  Buoy 42036; Surface & upper-air data: Tampa

Summary of 2000–2004 Data: Ozone

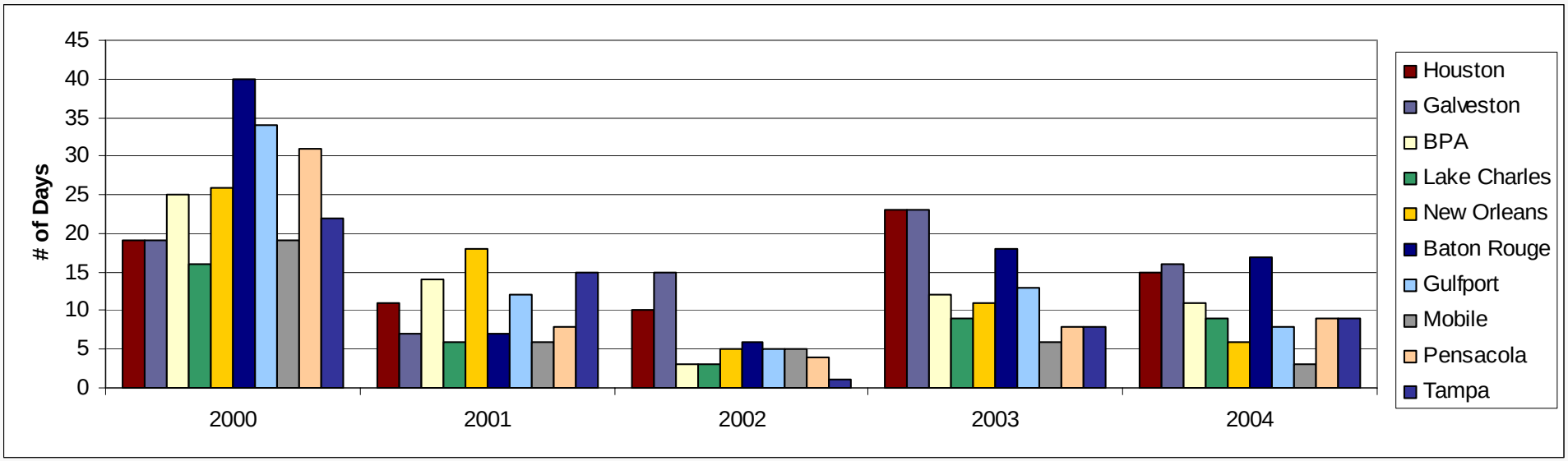
4th Highest Daily Maximum 8-Hr Ozone for Selected Sites



Note: Current 8-hr ozone standard is 75 ppb and is based on the 3-year average of the 4th highest 8-hour ozone concentration

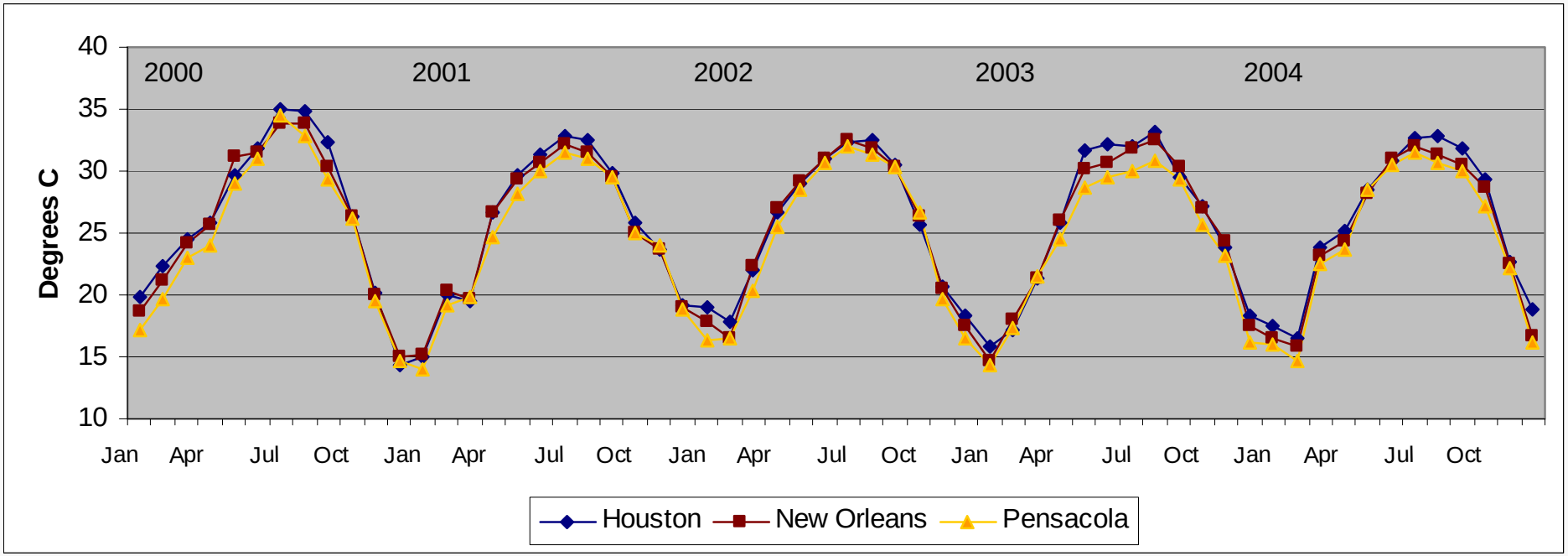
Summary of 2000–2004 Data: Ozone

of 8-Hr Ozone Exceedance Days for Selected Sites



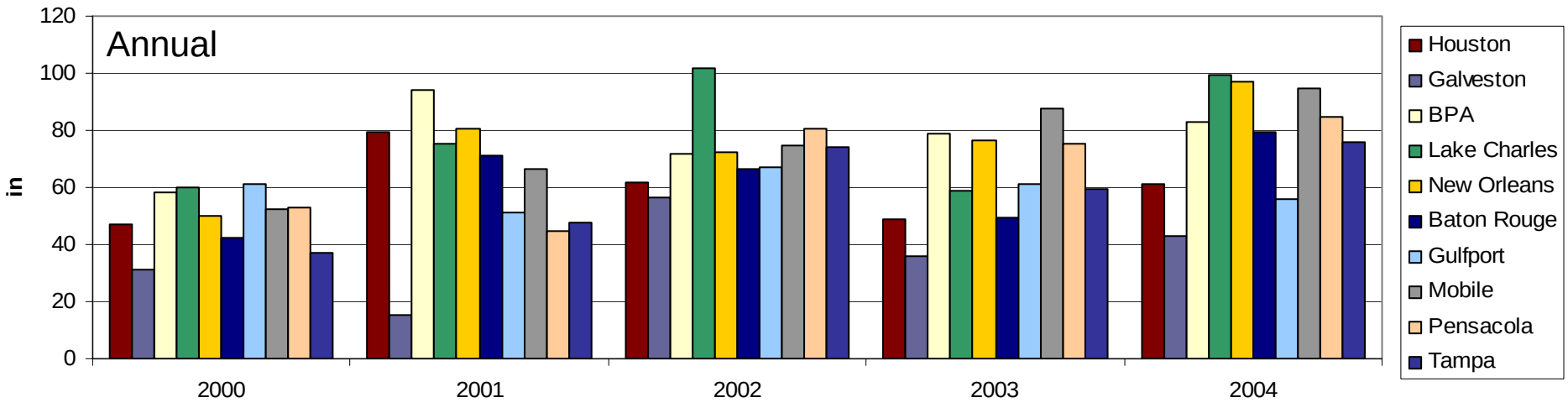
Summary of 2000-2004 Data: Temperature

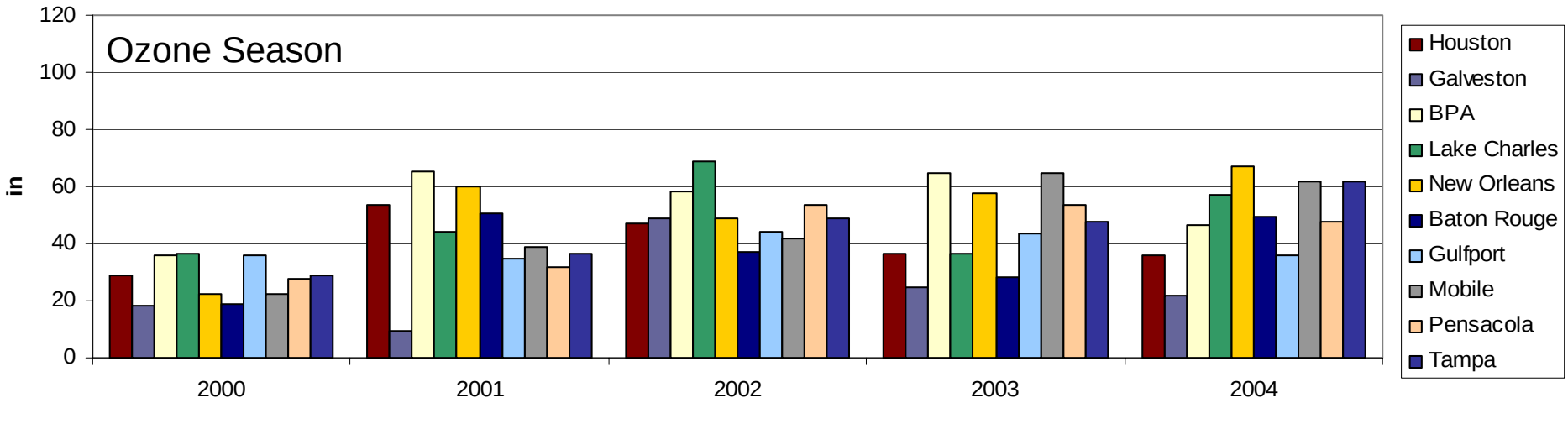
Monthly Average Daily Maximum Temperature



Summary of 2000–2004 Data: Precipitation

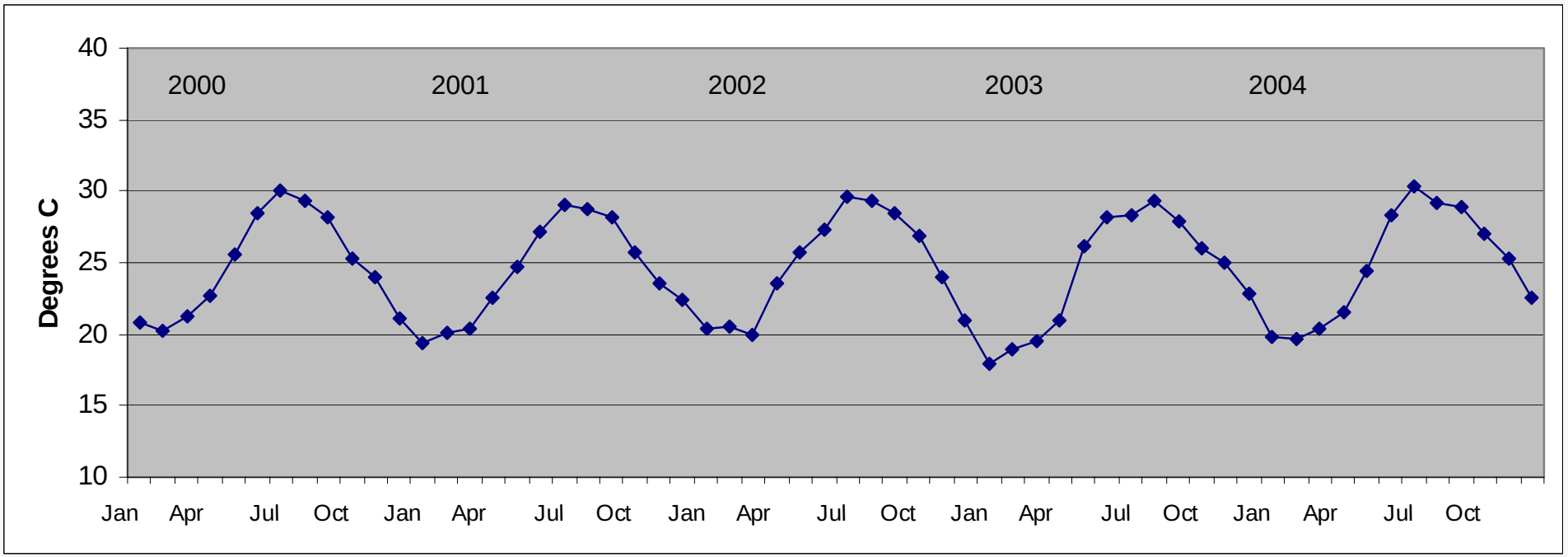
Annual & Ozone Season Precipitations Totals





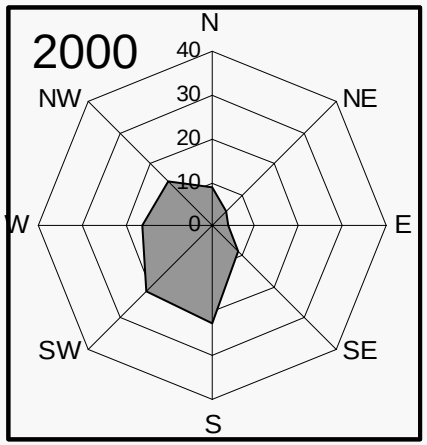
Summary of 2000–2004 Data: Sea Surface Temperature

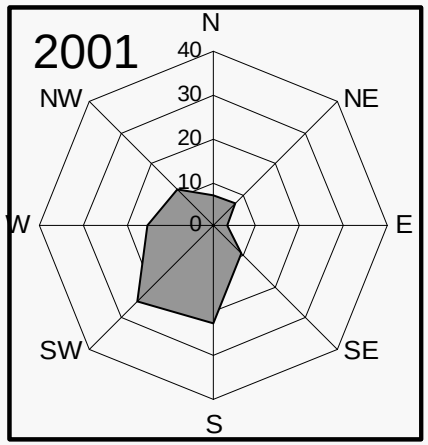
Monthly Average SST for Buoy #42040

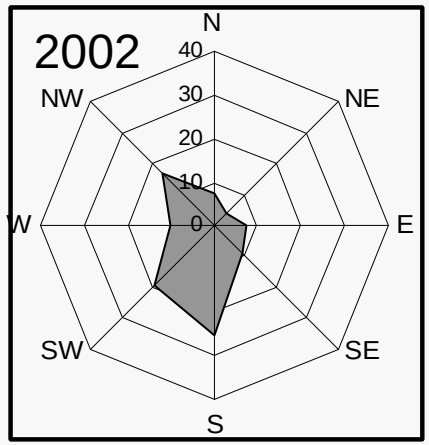


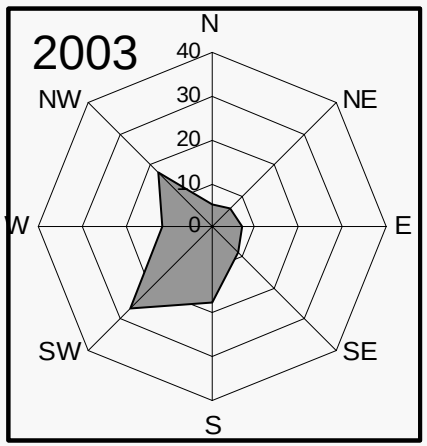
Summary of 2000–2004 Data: 850 mb Wind Direction

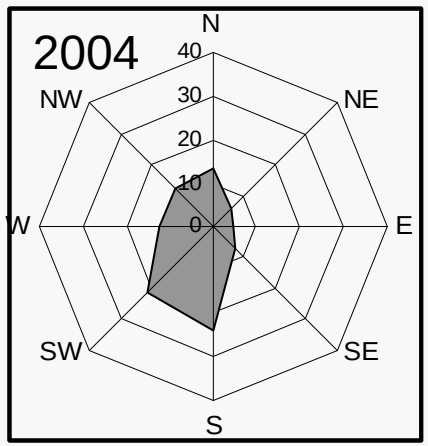
Annual 850 mb Wind Direction Distributions for Lake Charles

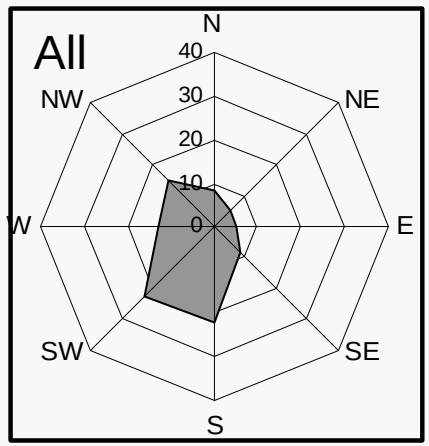






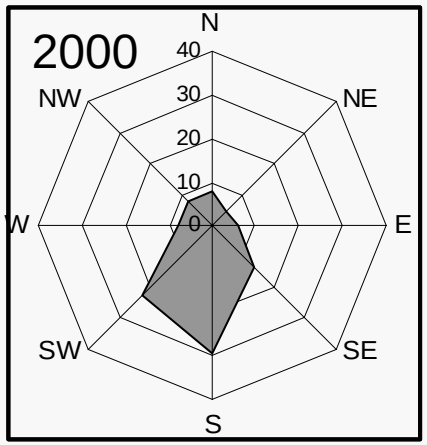


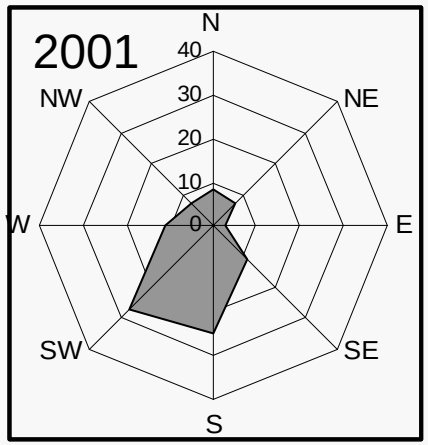


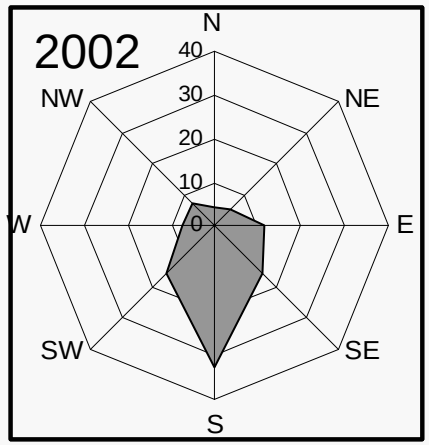


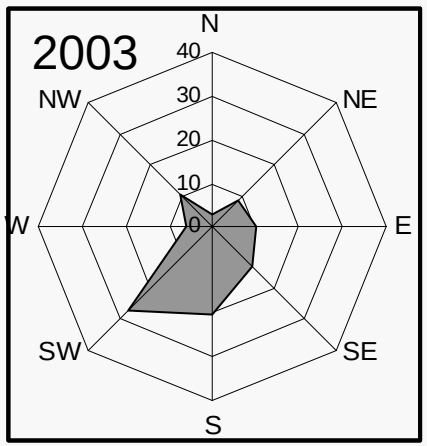
Summary of 2000–2004 Data: 850 mb Wind Direction

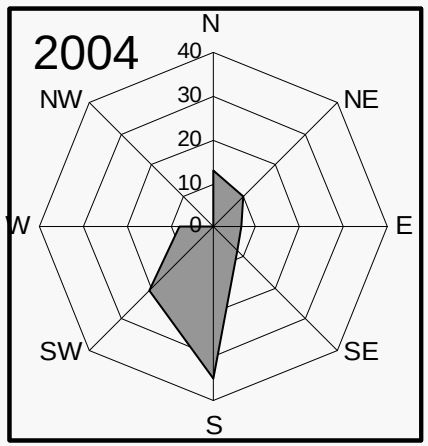
Ozone Season 850 mb Wind Directions for Lake Charles

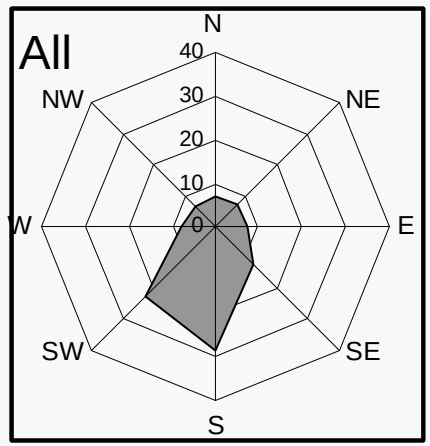












Summary of the 5-Year Meteorological & Air Quality Dataset

- Dataset includes years with range of different met and ozone air quality conditions
- Input files prepared for
  - CALMET/CALPUFF
  - Offshore Coastal Dispersion Model (OCD5)
- Dataset currently available to support
  - Dispersion modeling of existing and new OCS sources
  - Analysis of meteorological & 8-hour ozone data and evaluation of modeling results

How to Access the 5-Year Meteorological & Air Quality Dataset

- Review report “Five-Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico Region” (OCS Study MMS 2008-029)
- Compile of list of needed data files for your study & area
- Contact Holli Ensz at MMS:

Holli.Ensz@MMS.gov

Reference

Earth Tech, Inc. 2006. Development of the Next Generation Air Quality Models for Outer Continental Shelf (OCS) Applications: Model Evaluation. 3 vols. U.S. Department of the Interior, Minerals Management Service, Herndon, VA. OCS Study MMS 2006-006.