Global Drifter Program (GDP)

Drifting buoy measurements of Sea Surface Temperature, Mixed Layer Currents, Atmospheric Pressure, Salinity and Wind
http://www.aoml.noaa.gov/phod/dac/gdp.html

Rick Lumpkin, NOAA/AOML

Luca Centurioni, SIO

30th Data Buoy Cooperation Panel session

27-31 October 2014

Weihai, China

GDP: the principal component of the *Global Surface Drifting Buoy Array*, a branch of NOAA's *Global Ocean Observing System* (GOOS) and *Global Climate Observing System* (GCOS) and a scientific project of the DBCP.

Objectives:

Maintain a global 5°x5° array of ~1250 satellite-tracked Lagrangian surface drifting buoys to meet the need for an accurate and globally dense set of in-situ observations: mixed layer currents, SST, atmospheric pressure, winds, and salinity.

Provide data processing system for scientific use of these data.

These data support short-term (seasonal-to-interannual) climate predictions as well as climate research and monitoring.

Organization of the Global Drifter Program

GLOBAL DRIFTER PROGRAM
National Oceanic and Atmospheric Administration

Funding from NOAA's Climate Program Office. Additional instrument development at Scripps funded by ONR.
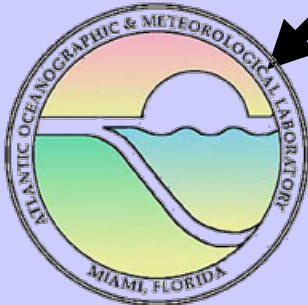
AOML (Miami, FL)
Rick Lumpkin

Scripps (La Jolla, CA)
Luca Centurioni
Supervises the industry, upgrades the technology, purchases most drifters, and develops enhanced data sets.

Manufacturers in private industry, who build the drifters according to closely monitored specifications
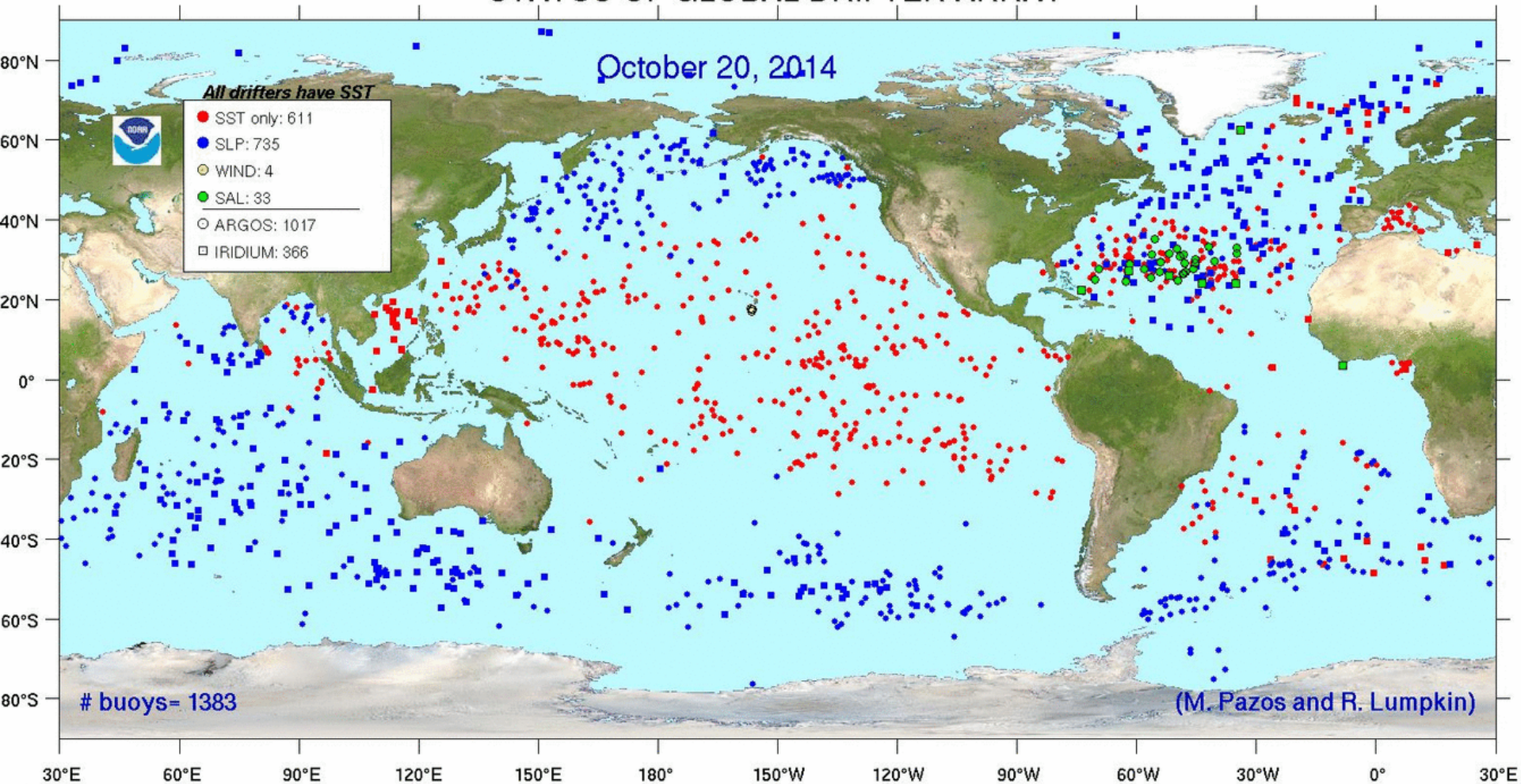
Drifter Operations Center (DOC)

Drifter Data Assembly Center (DAC)

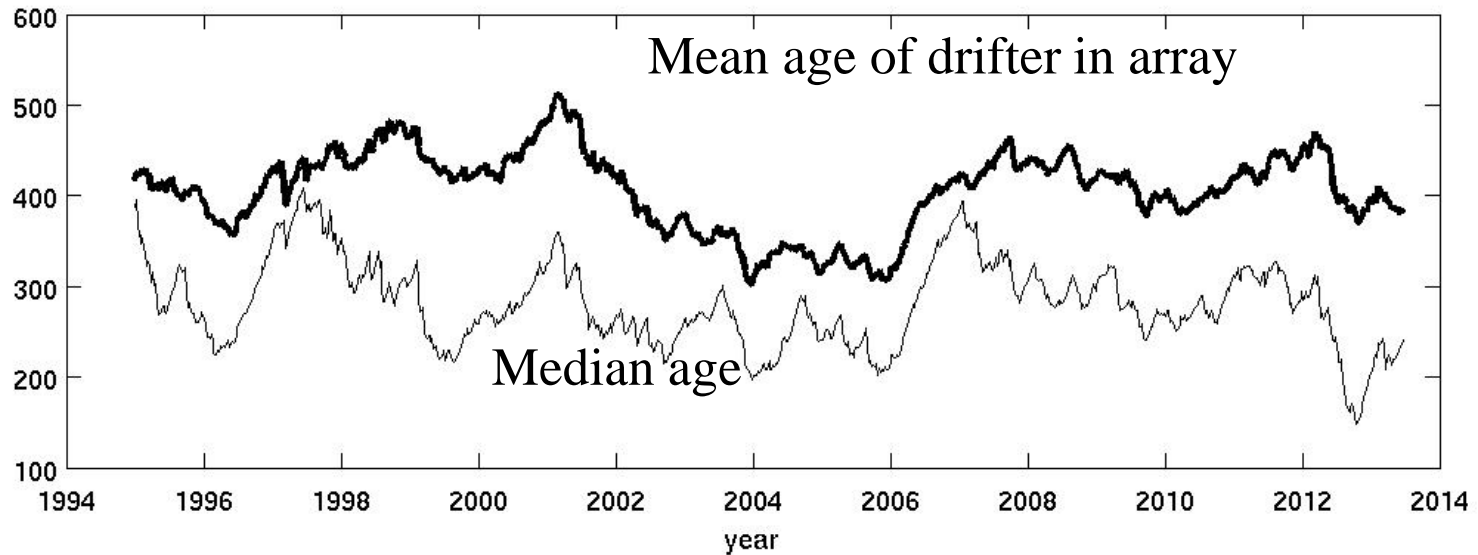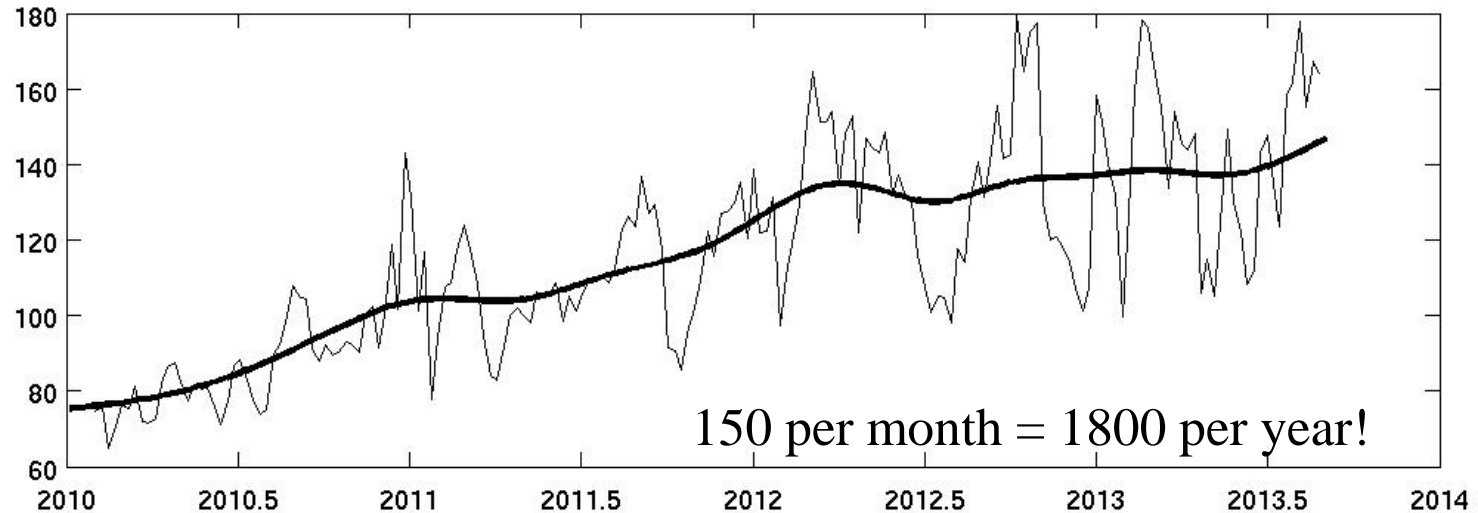# Current status of the global array

STATUS OF GLOBAL DRIFTER ARRAY

October 20, 2014

All drifters have SST
- SST only: 611
- SLP: 735
- WIND: 4
- SAL: 33
- ARGOS: 1017
- IRIDIUM: 366

buoys= 1383

(M. Pazos and R. Lumpkin)

Evolution of the array

From last year's report:

Number of deaths per 1250 drifters per month

150 per month = 1800 per year!

Mean age of drifter in array

Median age

Now:

Number of deaths per 1250 drifters per month

80 per month = 960 per year

Mean age of drifter in array

Median age
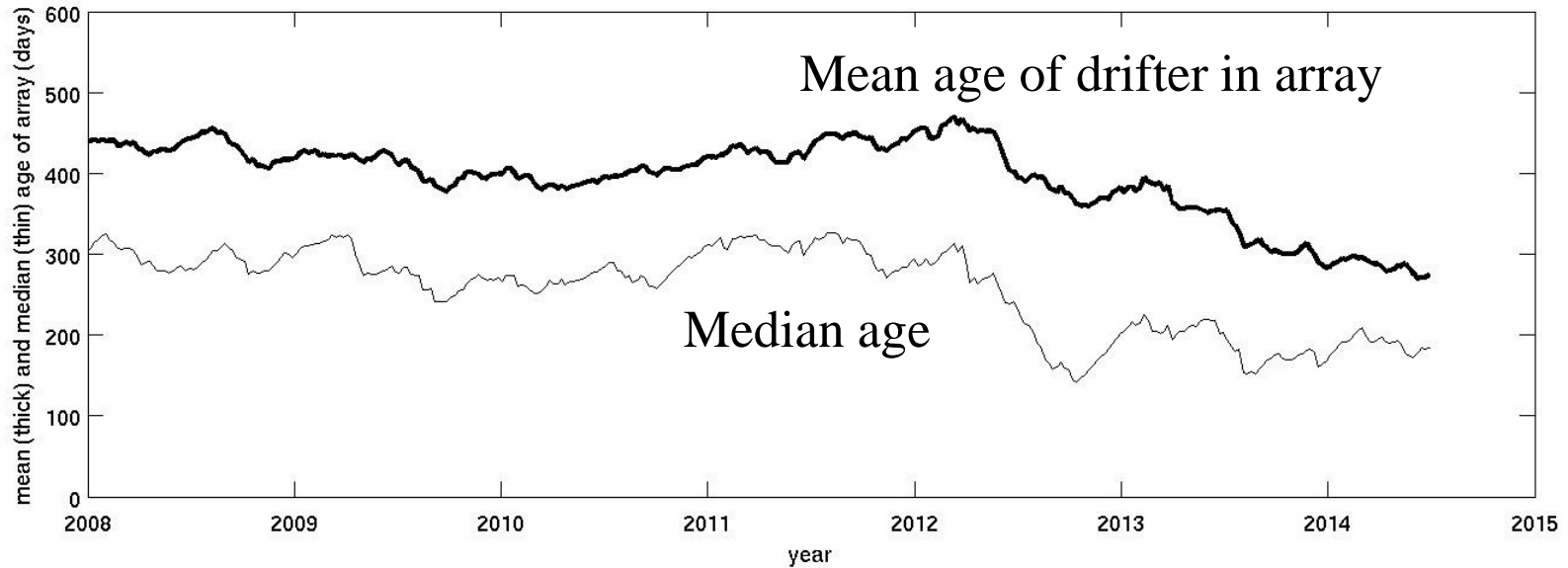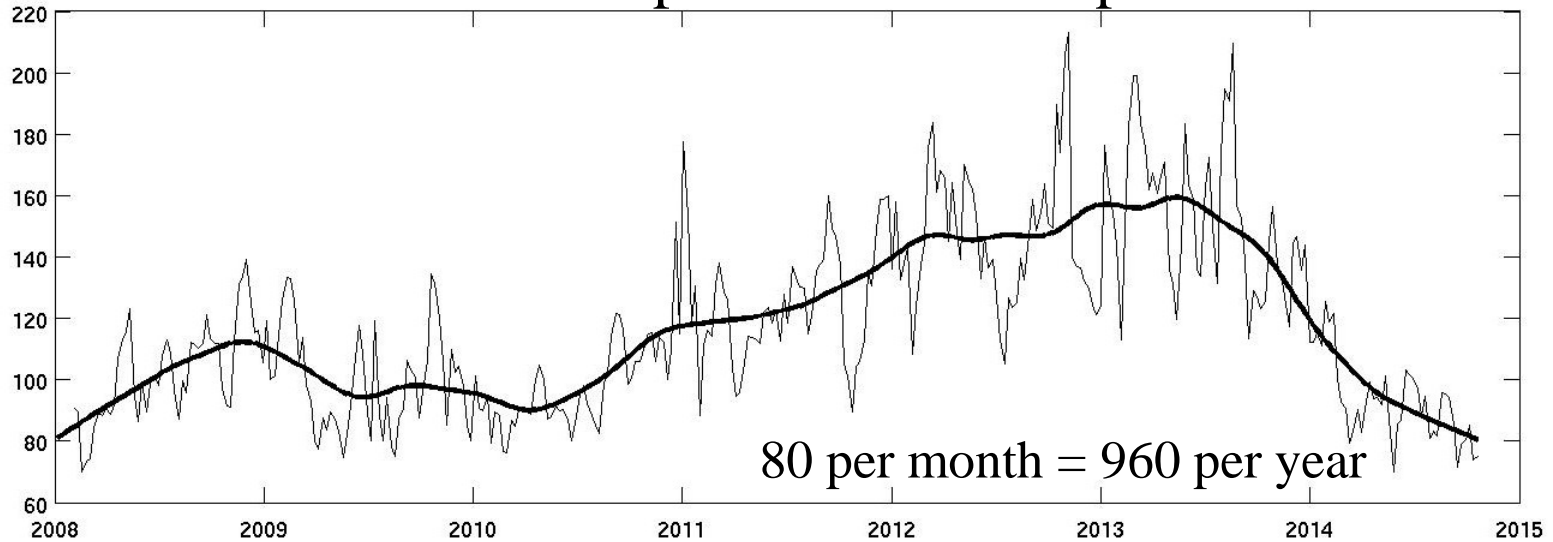
Half-life of drifters (days)

Number of days after which half are dead, as function of deployment year. Excludes drifters "ran aground" and "picked up"

2014: values through June. **Bold**: less than 200 days

"Quit" drifters:

Manufacturer	2007	2008	2009	2010	2011	2012	2013	2014
Clearwater	251	217	213	**160**	**155**	**199**	>309	>142
DBi	*	*	*	*	364	318	>390	>153
Marlin-Yug	635	856	634	>954	*	>725	*	*
Metocean	402	456	445	274	221	**186**	>291	>129
Pacific Gyre	262	598	336	345	236	227	>355	>149
SIO	*	*	*	*	*	201	>395	>138
Technocean	673	959	644	280	**190**	**53**	**0**	>37

Percent which lived <90 days

quit at <90d divided by # deployed that year. Includes Failed on Deployment

2014: values through June. **Bold**: more than **10%**.

Manufacturer	2007	2008	2009	2010	2011	2012	2013	2014
Clearwater	7%	**11%**	**11%**	**26%**	**27%**	**12%**	**13%**	**11%**
DBi	*	*	*	*	**25%**	9%	7%	3%
Marlin-Yug	0%	6%	0%	**18%**	*	**14%**	*	*
Metocean	7%	5%	6%	5%	**11%**	**18%**	**11%**	**17%**
Pacific Gyre	**12%**	**12%**	**17%**	4%	5%	7%	4%	5%
SIO	*	*	*	*	*	5%	8%	9%
Technocean	9%	8%	4%	**11%**	**32%**	**55%**	**90%**	**19%**

Drogue Half-Life (days)

Number of days after which half of drifters lose their drogue , as function of deployment year.
2014: values through June. **Bold**: less than **100 days.**

Manufacturer	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Clearwater	**72**	101	104	**95**	**84**	>293	>356	>170
DBi	*	*	*	*	279	228	242	>153
Marlin-Yug	152	**72**	**57**	167	*	**0**	*	*
Metocean	>373	269	224	**77**	**89**	110	>210	>144
Pacific Gyre	210	206	241	248	207	>228	>200	>127
SIO	*	*	*	*	*	**66**	>164	>146
Technocean	**45**	**33**	**63**	**74**	154	>62	**0**	>19

% with drogue off after <90 days

drifters lose their drogue at <90d divided by # deployed that year.

2014: values through June. **Bold**: more than **25%.**

| *Manufacturer*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*
Clearwater	**55%**	**36%**	**30%**	**36%**	**39%**	14%	4%	3%
DBi	*	*	*	*	25%	11%	12%	3%
Marlin-Yug	0%	**41%**	**46%**	**36%**	*	**43%**	*	*
Metocean	13%	17%	**26%**	**40%**	**46%**	**35%**	14%	15%
Pacific Gyre	20%	21%	17%	10%	16%	21%	9%	11%
SIO	*	*	*	*	*	**40%**	22%	8%
Technocean	**65%**	**78%**	**53%**	**46%**	**27%**	**31%**	**29%**	**31%**

% with drogue off after <10 days

drifters lose their drogue at <10d divided by # deployed that year.

2014: values through June. **Bold**: more than **10%.**

| Manufacturer	2007	2008	2009	2010	2011	2012	2013	2014
Clearwater	7%	4%	7%	7%	5%	3%	2%	0%
DBi	*	*	*	*	0%	4%	2%	0%
Marlin-Yug	0%	**24%**	**33%**	9%	*	**43%**	*	*
Metocean	8%	**13%**	6%	**12%**	6%	8%	4%	4%
Pacific Gyre	8%	**11%**	8%	2%	4%	7%	0%	0%
SIO	*	*	*	*	*	**24%**	1%	0%
Technocean	**10%**	**11%**	**10%**	9%	3%	**14%**	**14%**	**25%**

01-Aug-2013 to 31-Jul-2014: 1660 deployments
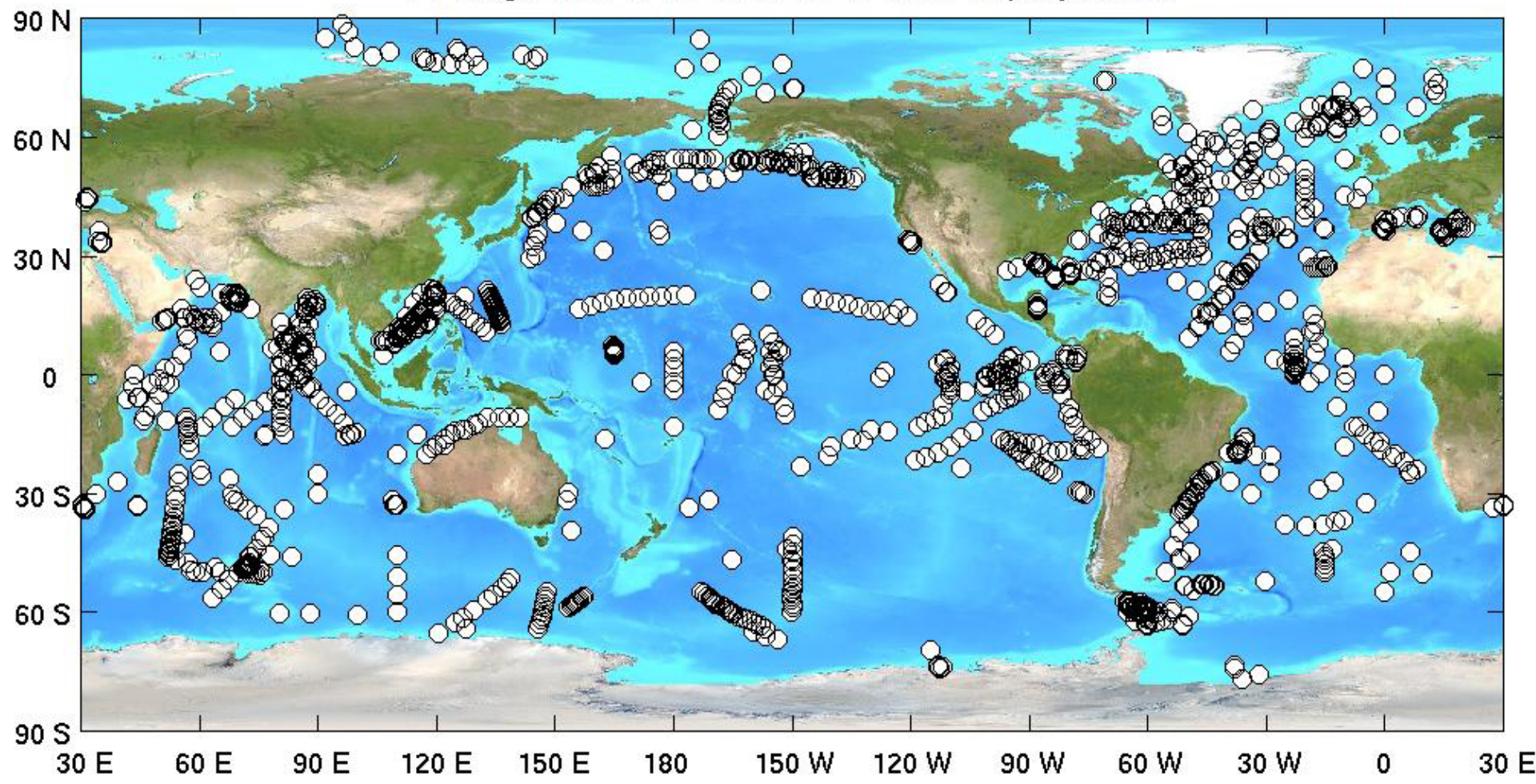
(1513 drifters deployed in the prior 12 months, Aug. 2012-July 2013)

Drifter Operations Center:
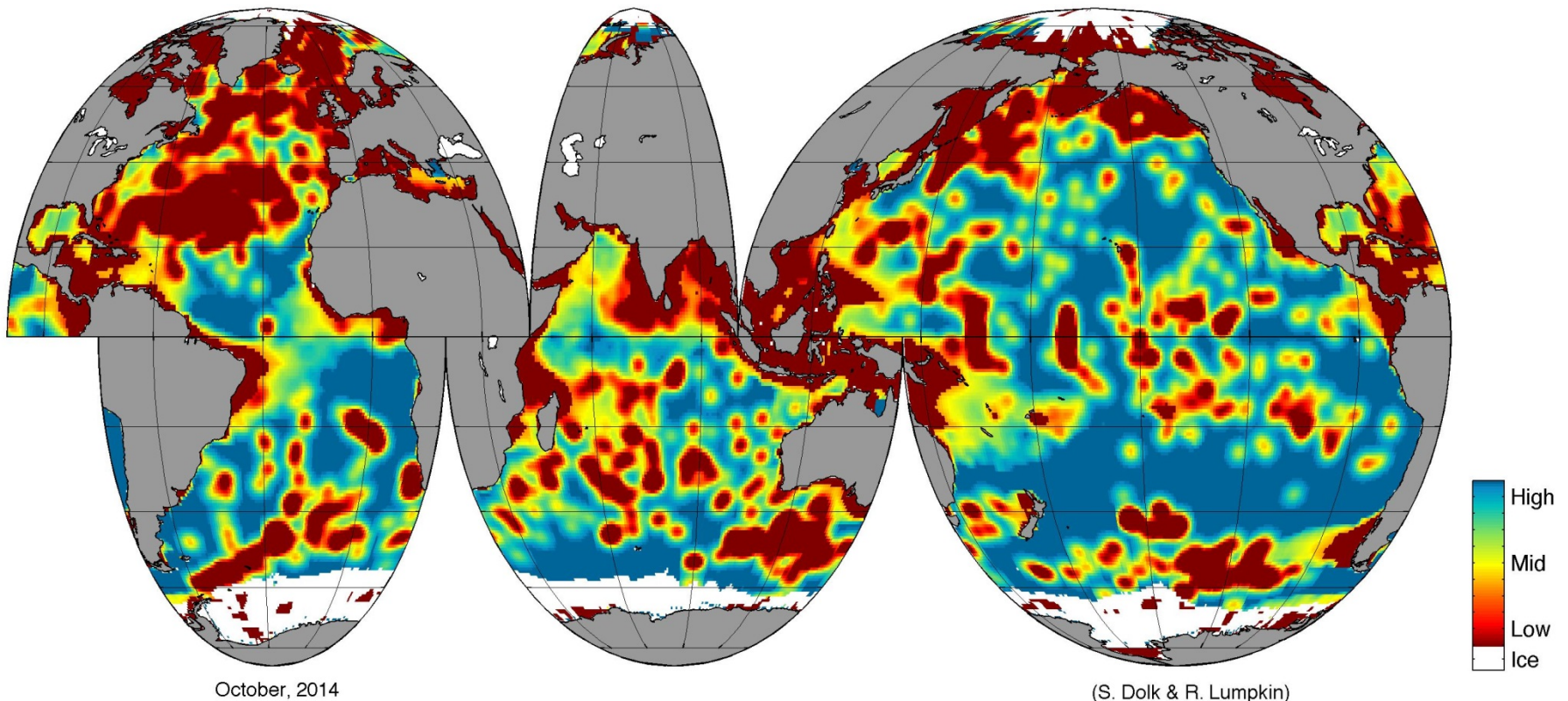Shaun Dolk (Miami, FL USA)
Shaun.Dolk@noaa.gov

Hurricane drifter deployments
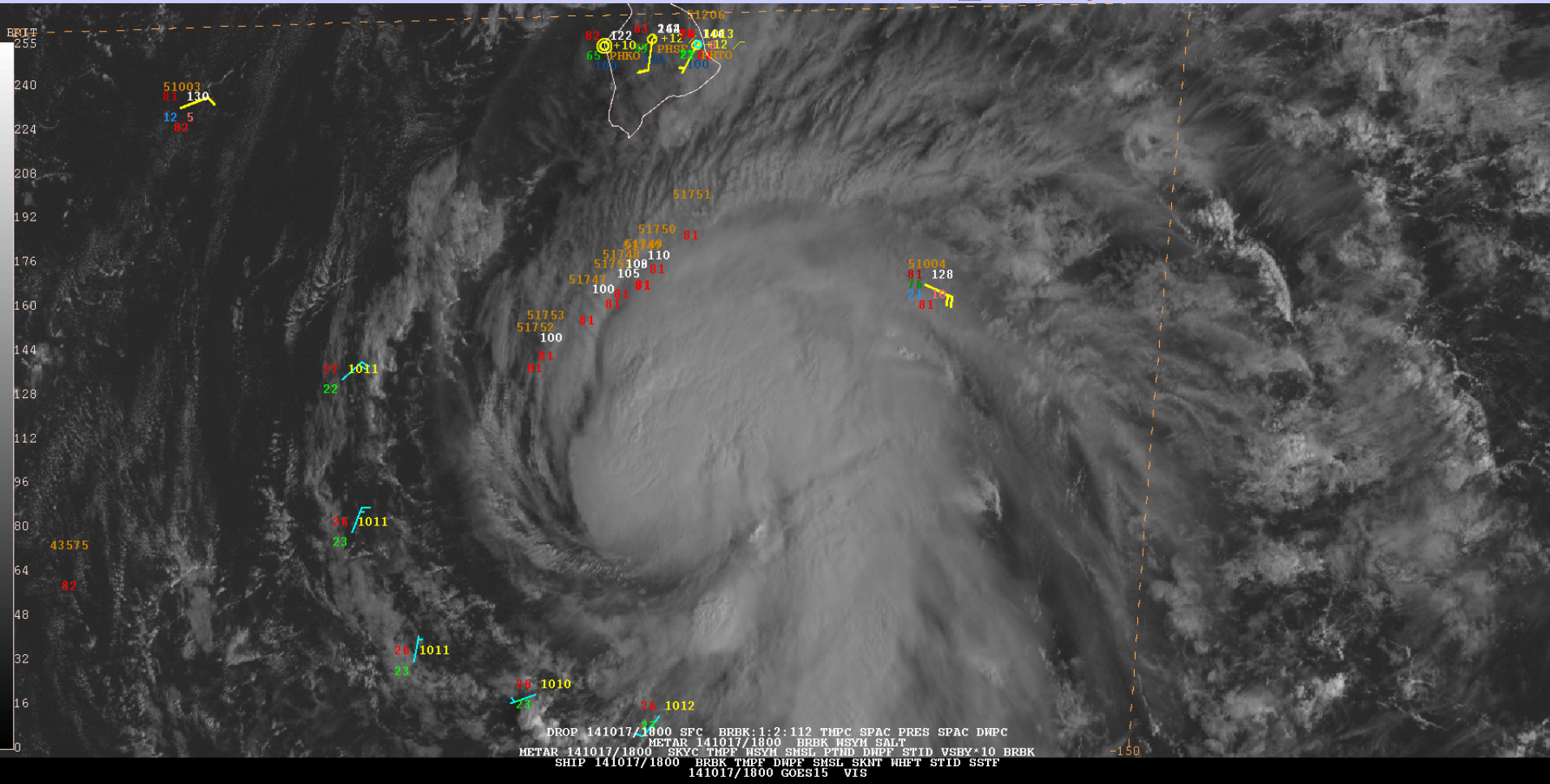
10 hurricane drifters (5 with thermistor chains) deployed by Air Force Hurricane Hunter C-130J in the path of strengthening (soon to be hurricane) Ana, south of the Big Island of Hawaii on 17 October 2014.

New product: drifter deployment value maps

Global Drifter Array - Deployment Values

October, 2014

(S. Dolk & R. Lumpkin)

High
Mid
Low
Ice

http://www.aoml.noaa.gov/phod/dac/doc_valuemaps.php

Deployment plans for 2014-2015

In the coming year, the GDP Deployment Plan is:

Operational Buoy Deployments	800
Consortium Research Buoy Deployments	200
Total Deployments in 2013-2014	1000

More deployments may be needed to fill gaps in the global array as they develop, and will be conducted if more drifters are available for deployment.

In addition to the regular deployment opportunities provided by vessels of opportunity and regularly occurring research cruises, notable deployments planned for August 2014-July 2015 include:
- ~ 80 SVP drifter deployments in the equatorial Pacific, during TAO mooring cruises (~ 10 deployments per line)
- 20-25 SVPB drifter deployments in the N. Pacific, during the annual DART cruise
- 30 SVPB drifter deployments in the S. Pacific from the R/V *Araon*
- ~40 SVPB drifter deployments in the Indian Ocean, during RAMA mooring cruises
- 10 SVPB drifter deployments in the Indian and Pacific Oceans from the R/V *Kaharoa*
- 10 SVP drifter deployments in the tropical Atlantic Ocean from the MV *Explorer*
- 20 SVP drifter deployments in the equatorial Pacific from the MV *Explorer*
- 10 SVPB drifter deployments in the Indian Ocean from the MV *Explorer*
- ~50 SVP drifter deployments in the Pacific Ocean by the US Coast Guard
- 40 SVPB drifter deployments in the Drake Passage
- 20 SVPB drifter deployments in the SE Pacific Ocean by new GDP partners at the University of Valparaiso
- ~30 SVP drifter deployments in the equatorial Pacific by GDP partners in Peru, Columbia, Chile, and Ecuador
- ~20 SVP drifter deployments in the Pacific Ocean during the Blue Planet Odyssey sailing event
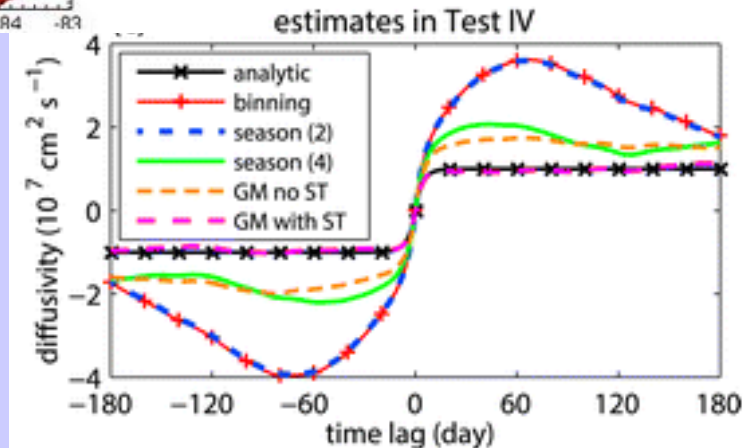
Research

Structure of cyclonic frontal eddies in the Gulf of Mexico from drifter and satellite measurements
Le Henaff et al. (2014)
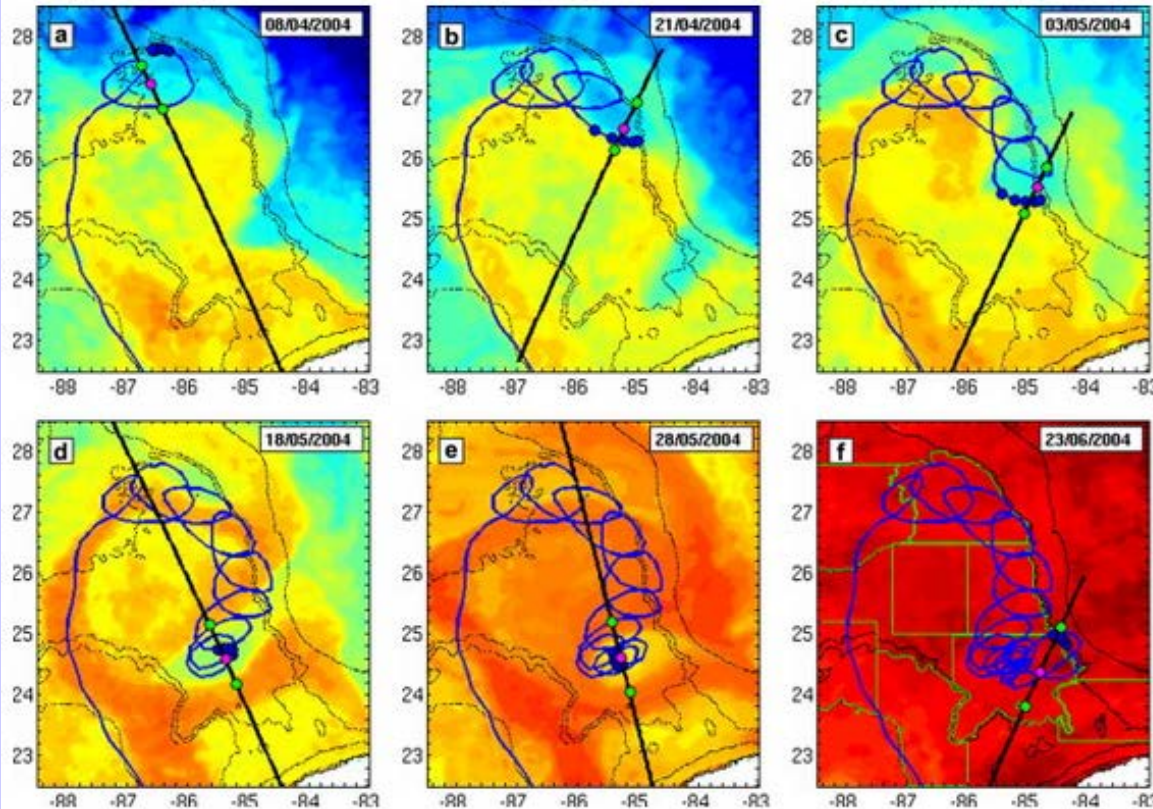
Quantifying the impacts of inhomogeneous mean flow on the calculation of diffusivity, as a function of methodology used to identify the mean flow
Peng et al. (2014)

Our appreciation to the following partners for their contributions to GDP activities

NOAA's Voluntary Observation Ships, Ships of Opportunity, and National Marine Fisheries Service programs; NOAA/Pacific Marine Environmental Laboratory, NOAA/National Data Buoy Center

Argo program

International Ice Patrol

Institut de Recherche pour le Développement; Météo-France (France)

Leibniz-Institut für Meereswissenschaften an der Universität Kiel (Germany)

New Zealand Met. Service

Australian Bureau of Meteorology

Fundação Universidade Federal do Rio Grande; Instituto Nacional de Metereologia; Centro de Hydrografia de Marinha; INPE (Nacional Space Institute); Brazilian Navy; Brazilian Naval Directorate of Hydrography and Navigation (Brazil)

Fisheries Research Institute; Servicio de Hidrografía Naval (Argentina)

Instituto Canario de Ciencias Marinas; Universidad de Las Palmas de Gran Canaria (Spain)

Instituto Nazionale di Oceanografia e di Geofisica Sperimentale (Italy)

National Institute of Oceanography; National Institute of Ocean Technology (India)

Institute of Hydrological and Oceanic Services (Taiwan)

Centro de Investigacion Cientifica y de Educacion Superior de Ensenada (Mexico)

Korean Oceanographic Research and Dvelopment Institute, National Oceanographic Research Institute; Ministry of Maritime Affairs and Fisheries (Korea)

Instituto del Mar del Peru

Tristan da Cunha Administration, Tristan Island

United Kingdom Met Office

Fisheries Department of Falkland Islands

Environment Canada

University of Cape Town; South African Weather Service (South Africa)

Scripps Institution of Oceanography, Woods Hole Oceanographic Institution, Oregon State University, Marine Resources Research Institute, (United States)

United States Air Force

US Naval Oceanographic Office

United States Coast Guard

Raytheon Polar Services

Half-life calculations

The half-life tells us how long it takes for 50% to die. Unlike mean lifetime, which can't be calculated until ALL are dead, we can calculate this once half are dead.

Simple example: 100 drifters are deployed, the half life is the number of days it takes 50 drifters to die

If more than half are still alive, we can calculate an "at least" half life:
1) For still alive drifters: use age (so far) instead of death age.
2) Calculate half-life using all ages.
3) Remove "still-alive" ages that are < half life.
4) Repeat 2, 3 until all "still-alive" ages are > half life.