Rip Current Local Collaboration Project
Observation, Analysis, and Forecasting

Mike Churma, John Schattel, Chung-Sheng Wu
NWS Meteorological Development Laboratory
Rip Currents -- A jet-like seaward flow across the surf zone of a beach.
In 2011, 30,981 out of 60,635 total rescues by lifeguards involved rip currents (Source – usla.org)
Without observations of rip currents we can not verify rip current forecasts for beach safety.

2004 NWS-Sea Grant Rip Current Technical Workshop:

“A pilot program should be implemented to monitor rip currents so as to reduce the hazard they pose to the public.”
Stakeholders: A Team Approach

**MDL OST**
- Science
- Development

**OCWWS**
- Policy
- Coordination

**Regions/WFOs**
- Forecasting
- IDSS

**Local Lifeguards**
- Beach Safety
- Observations
Participating Beaches
Lifeguard Observes (2/day)

Observation entered into web form

Observation Stored In Rip Current Database

Supplemental Data Added

Analyze Observations
Permanent outcroppings along the shoreline, such as jetties or piers, can cause rip currents, especially with oblique wave angles.

Near-normal incoming waves will most likely cause rip currents at beaches with no permanent outcroppings.
Wave breaks when wave height is $> \sim 0.8$ times the water depth.

Rip currents are more often seen at beaches with mild slopes instead of steep slopes, because this affects the surf zone width and therefore the amount of water transport.
Changes in water level via tides or (in the Great Lakes) seiches or seasonal water level variations can provoke rip currents through surf zone with changes and increase channeling through sandbars.
Lifeguard Observes (2/day)

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Supplemental Data Added

Analyze Observations
# Rip Current Monitoring Report

**Beach Name:** Daytona Beach  
**Report Date:** 2012-07-13  
**Report Time:**  

<table>
<thead>
<tr>
<th>Surf Height (Feet): [Examples: 1 or 2-3]</th>
<th>Surf Zone Width (Yards): [Example: 25]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming Wave Direction: Select Wave Direction</td>
<td>Tide: Select Tide</td>
</tr>
<tr>
<td>Rip Observed?: Yes</td>
<td>Rip Currents Activity: High</td>
</tr>
<tr>
<td>Number of Rip Rescues: [Example: 3]</td>
<td>Water Temperature (°F): [Example: 72]</td>
</tr>
</tbody>
</table>

Comments (Rip pull distance, cuts in bars, longshore current, # of waves per set, # of rips):

Lifeguard:  

Required: Please type the word "eight" in the box:  

[Submit Your Report][Reset]
1. Lifeguard Observes (2/day)

2. Observation entered into web form

3. Observation Stored In Rip Current Database

4. Supplemental Data Added

5. Analyze Observations
Jacksonville Beach Rip Current Report

LOCATION: Jacksonville Beach
OBSERVATION TIME (L): 2012-07-17 12:05 PM
SURF HEIGHT (FT): 2-3
SURF ZONE WIDTH (YDS): 80
WAVE DIRECTION: E
WATER LEVEL CATEGORY: Falling
RIP CURRENT OBSERVED (Y/N): Yes
RIP CURRENTS ACTIVITY: High
RIP RESCUES: 5
WATER ATTENDANCE: High
COMMENTS: Extremely hazardous conditions persist throughout area. Deep sloughs and powerful feeder currents are creating unusually strong rip current conditions.
LIFEGUARD: Taylor Anderson
Rip Current Activity Level

-- A subjective assessment of activity of rip currents that could impact swimmers at a particular beach. It encompasses aspects of both the strength and number of rip currents

- **High Activity:** Many, strong rip currents
- **Medium Activity:** Many, weak rip currents
- **Low Activity:** A few weak rip currents
- **No Activity:** No rip currents
Lifeguard Observes (2/day)

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Supplemental Data Added

Analyze Observations
Models:
WaveWatch III
Coastal Data Information Program (CDIP)
Great Lakes Coastal Forecasting System (GLCFS)

Stored Obs/Forecast Parameters (when available):
- Wave Ht/Pd/Dir
- Swell Ht/Pd/Dir
- Tide Level
- Water Temperature

Corresponding model data and station observations are paired with the lifeguards reports for later analysis
1. Lifeguard Observes (2/day)

2. Observation entered into web form

3. Observation Stored In Rip Current Database

4. Supplemental Data Added

5. Analyze Observations
<table>
<thead>
<tr>
<th>Surf (ft)</th>
<th>1.5 - 2.0</th>
<th>2.0 – 3.0</th>
<th>3.0 - 5.0</th>
<th>Preventive warnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tide level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>1270</td>
</tr>
<tr>
<td>Mid</td>
<td>3</td>
<td>9</td>
<td>0</td>
<td>456</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td>Sub-total</td>
<td>5</td>
<td>18</td>
<td>4</td>
<td>1775</td>
</tr>
</tbody>
</table>

Encinitas Lifeguards safety service record (7/1-8/30/2008)
Many beach rescues occur in 2-3 ft waves (WFO-SGX).
“This ongoing project is a good example of how a clear goal and good communications between HQ, WFO, emergency partners, and media can work and be successful for a common cause.”

Noel Isla, WFO-SGX
Lifeguard Observes (2/day)

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Analyze Observations
Rip Current Forecasting Tools (Wu)

Incorporating input from key rip current forcing factors:

- Significant Wave Heights
- Coastal Winds
- Peak Wave Periods
- Total Water Levels

Other factors to take into account:

- beach orientation
- hot weather
- beach sand characteristics

Model types tested:

- Check List Tables
- Parametric Models
- Regression Models
Automated Local Rip Current Guidance

\[ RI = A*H + B*T - C*h \]

H = Surf Zone wave ht; T = Surf Zone Wave Pd.; H = Water Level

A, B, C = empirically-derived coefficients (e.g., beach slope and orientation)

- None or Very Low: RI < 1.0
- Low: 1.0 ≤ RI < 1.2
- Medium: 1.1 ≤ RI < 1.2
- High: RI ≥ 1.2

Rip Current Episode -- An extended period of medium to high rip current activity at a beach lasting from a few hours to several days.
### MDL Automated Local Rip Current Guidance Skill Scores

**Summer 2011 at Daytona Beach, FL**

<table>
<thead>
<tr>
<th>Hurricane Event</th>
<th>POD (Probability of Detection)</th>
<th>FAR (False Alarm Rate)</th>
<th>CSI (Critical Success Index)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricanes Irene &amp; Katia</td>
<td>0.71</td>
<td>0.26</td>
<td>0.67</td>
</tr>
<tr>
<td>08/24 – 09/15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer 2011</td>
<td>0.65</td>
<td>0.27</td>
<td>0.63</td>
</tr>
<tr>
<td>05/20-09/25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Experimental MDL Rip Current Activity Level page – Lifeguard Rip Activity reports mapped to beaches.

Short-Term Goals

1. Provide WFO’s and partners with instant access to past lifeguard reports, supplemental data, and automated local rip current guidance.

2. Assist WFO’s with setting up rip current collaboration with local lifeguard agencies.

3. Send rip current reports/alerts to WFO’s via AWIPS.
Long-Term Goals

1. Develop beach-specific rip current forecasts and diagnostics.

2. Create methodology that can be shared with WFO’s to develop their own formulas.

3. Share lifeguard reports and rip current diagnostics/forecasts with the public.

-- Working towards an Impacted-Based Decision Support Services approach for rip current hazards.
(Listed from left to right):

- Julie Thomas, Andrew MacAuthor, Dr. William O'Reilly, Dr. C-S Wu, Michael Khuat, Ivory Small, Mayor Maggie Houlihan, Noel Isla, Dr. Stephan Smith, Capt. Larry Giles, Jason Taylor, and Sgt. David Rains