

## FRANCISCO ESTEBAN WERNER

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### **Professional Experience**

*Director*, Southwest Fisheries Science Center, NOAA/NMFS (2011-present)  
*Director and Professor*, Institute of Marine and Coastal Sciences, Rutgers University (2008-2010)  
*George & Alice Welsh Distinguished Prof.* (2005-2008)  
*Chairman*, Department of Marine Sciences UNC-CH (2000-2007)  
*Director*, Marine Sciences Program (2000-2007)  
*Professor*, Department of Marine Sciences, UNC-CH (1996-2008)  
*Associate Professor*, Marine Sciences Curriculum, UNC-CH (1993-1996)  
*Associate Professor*, Skidaway Institute of Oceanography, Savannah, GA (1991-1993)  
*Visiting Professor*, Depto. de Física, Univ. de las Islas Baleares, Palma de Mallorca, Spain, (Fall 1991)  
*Assistant Professor*, Skidaway Institute of Oceanography, Savannah, GA (1988-1991)  
*Research Assistant Professor*, Thayer School of Engineering, Dartmouth College, Hanover, NH (1984-1989)

### **Professional Interests**

Fisheries oceanography; structure and function of marine ecosystems; ocean circulation physics; development and implementation of ocean/environmental forecasting systems.

### **Personal:**

Birth: 13 November 1957; Maracaibo, Venezuela  
Citizenship: U.S. (since 1996)  
Languages: Fluent in English, Spanish and Hungarian

### **Education, University of Washington**

Ph.D. Physical Oceanography (1984)  
M.Sc. Physical Oceanography (1981)  
B.Sc. Mathematics (1978); *magna cum laude*, Phi Beta Kappa

### **Selected Leadership Roles** (complete list in Appendix):

Member, NCAR's Community Earth System Modeling (CESM) Advisory Board (CAB); 2010-present  
Member, Scientific Advisory Committee, Leibniz-Zentrum für Marine Tropenökologie, Bremen, Germany (2009-2011)  
Chairman, GLOBEC-International Scientific Steering Committee: 2003-2007.  
International Geosphere-Biosphere Program (IGBP) Scientific Steering Committee: member, 2003-2007.  
NSF's ORION iOSC 2007 & Science and Technology Advisory Committee (STAC) 2005-2007.  
NSF ORION Coastal Subcommittee member & Modeling Study Group member, 2005-2007.  
U.S. GLOBEC Scientific Steering Committee: member, 2000-2007.  
Chair, Gordon Research Conference on Coastal Circulation Modeling, 2007.  
Science Synthesis Committee for the National Science Foundation's OCE Decadal Planning Activity: member, 1998-2000.

### **Selected Professional Service** (further listings in Appendix):

Organizing Committee member: Advances in Marine Ecosystem Modeling Research, Plymouth, UK, 2005 and 2008; North Atlantic Marine Ecosystem Basin Scale Studies, Reykjavik, Iceland, 2005; Computational Methods in Water Resources, Chapel Hill, NC, 2004; GLOBEC Open Science Conf., Qingdao, China, 2002.

Workshops led and co-convened:

- Biological Skill Assessment Workshop, Chapel Hill, 2005-2006;
- Modeling Approaches to Studies of Coastal Ocean Circulation Processes, Chile, Aug. 2003;
- Population Connectivity in Marine Ecosystems, Durango CO, Oct. 2003;
- Modeling Tools for the Study of Larval Drift Processes of Scallops and their Influence on the Availability of Recruits for Aquaculture, La Paz, Mexico, May 2002;
- Biophysical Modeling in Oceanic Environments, North Carolina Supercomputing Center, RTP North Carolina, Jan. 1998;
- Numerical Modeling of Shallow Water Hydrodynamics, Inst. para la Conservación del Lago de Maracaibo, Venezuela, Aug. 1996;
- Coastal Physics and Modeling of Coupled Physical/Biological Processes, Universidad de Valparaíso, Chile, Dec. 1995.

**Journal Editorships:**

Editor in Chief, *Progress in Oceanography*, Jan 2007-present.

Editorial Board of *Revista de Biología Marina y Oceanografía*, 2003-present.

Editorial Board of *Fisheries Oceanography*, 1998-present.

Guest Editor, *Ecological Modelling* (2011-2012; *Climate Change and Marine Ecosystem Models*); *Advances in Water Resources* (1989; *Special Issue on the Tidal Flow Forum*); *Fisheries Oceanography* (1999; *Special Issue on the South Atlantic Bight Recruitment Experiment*); *Ecological Modelling* (2006; *Special NEMURO Issue*); *Journal of Marine Systems* (2007; *Special Issue on Phys-Bio Model Skill Assessment*).

**Book Edited and Best Paper Award:**

*Global Change and Marine Ecosystems*; M.A. Barange, J.G. Field, R.H. Harris, E. Hofmann, R.I. Perry and F.E. Werner (Eds.). Oxford University Press, 2010; ISBN13: 9780199558025, 464pp.

Kendall Best Paper in *Transactions of the American Fisheries Society* for “Climate Regime Effects on Pacific Herring Growth Using Coupled Nutrient–Phytoplankton–Zooplankton and Bioenergetics Models” coauthored with Rose et al.

**Funding** (funding history in Appendix):

Over \$12M million career total

**Teaching** (see Appendix):

- General Oceanography;
- Coastal Circulation Theory;
- Ocean Circulation Theory;
- Advanced Ocean Circulation Modeling;
- Modeling of Marine Systems;
- Biological Processes and Physical Forcings;
- First Year Seminar “Where did all the fish go?”
- Turbulence and Boundary Layers (Continuum Mechanics)

**Student Committees** (see Appendix):

10 Ph.D., 9 M.Sc., 3 Post-Docs

### Peer Reviewed Publications:

Fogarty, M.J., L.W. Botsford, and F.E. Werner (2013) Legacy of the US GLOBEC Program: Current and Potential Contributions to Marine Ecosystem-Based Management *Oceanography* 26(4):116–127.

Levin, P. S., Kelble, C. R., Shuford, R., Ainsworth, C., deReynier, Y., Dunsmore, R., Fogarty, M. J., Holsman, K., Howell, E., Monaco, M., Oakes, S., and Werner, F. (2013) Guidance for implementation of integrated ecosystem assessments: a US perspective. – *ICES Journal of Marine Science*, doi:10.1093/icesjms/fst112.

Stock, C.A., M.A. Alexander, N.A. Bond, K.M. Brander, W.W.L. Cheung, E.N. Curchitser, T.L. Delworth, J.P. Dunne, S.M. Griffies, M.A. Haltuch, J.A. Hare, A.B. Hollowed, P. Lehodey, S.A. Levin, J.S. Link, K.A. Rose, R.R. Rykaczewski, J.L. Sarmiento, R.J. Stouffer, F.B. Schwing, G.A. Vecchi, and F.E. Werner (2011) On the use of IPCC-class models to assess the impact of climate on Living Marine Resources. *Prog. Oceanography*, v.88, 1-27.

Kishi, M.J., S-I Ito, B.A. Megrey, K.A. Rose and F.E. Werner (2011) A review of the NEMURO and NEMURO.FISH models and their application to marine ecosystem investigations. *J. Oceanography* (Oceanographic Society of Japan), v.67, 3-16.

Barange, M., I. Allen, E. Allison, M-C. Badjeck, J. Blanchard, B. Drakeford, N.K. Dulvy, J. Harle, R. Holmes, J. Holt, S. Jennings, J. Lowe, G. Merino, C. Mullon, G. Pilling, L. Rodwell, E. Tompkins and F. Werner (2011) Predicting the Impacts and Socio-Economic Consequences of Climate Change on Global Marine Ecosystems and Fisheries: the QUEST\_Fish Framework. *World Fisheries: A Social-Ecological Analysis*, First Edition. Edited by Ommer, Perry, Cochrane and Cury; Blackwell Publishing Ltd; pp.31-59.

deYoung, B., F. Werner, H. Batchelder, F. Carlotti, Ø. Fiksen, E.E. Hofmann, S. Kim, H. Yamazaki and M. Kishi (2010) Dynamics of marine ecosystems: physical-biological interactions - integration and modeling. In: M. Barange, J.G. Field, R.H. Harris, E. Hofmann, R. I. Perry, F. Werner (Eds.) *Global Change and Marine Ecosystems*. Oxford University Press, 89-128.

Hofmann, E.E., M. Barange, J.G. Field, R.P. Harris, R.I. Perry, and F. Werner (2010) Marine ecosystems and global change: a synthesis. In: M. Barange, J.G. Field, R.H. Harris, E. Hofmann, R. I. Perry, F. Werner (Eds) *Global Change and Marine Ecosystems*. Oxford University Press, 323-336.

Fréon, P., F.E. Werner and F. Chavez (2009) Predicted effects of climate change on SPACC systems. In: *Climate Change and Small Pelagic Fish*, Edited by D. Checkley, J. Alheit, Y. Oozeki, and C. Roy. Cambridge University Press, 312-343.

Kristiansen, T., R.G. Lough, F.E. Werner, E.A. Broughton and L.J. Buckley (2008) Individual-based modeling of feeding ecology and prey selection of larval cod on Georges Bank. *Mar. Ecol. Prog. Ser.*, doi: 10.3354/meps07796.

Edwards, K.P., J.A. Hare and F.E. Werner (2008) Dispersal of black sea bass (*Centropristis striata*) larvae on the southeast U.S. continental shelf: results of a coupled vertical larval behavior- 3D circulation model. *Fisheries Oceanography*, 17:299-315.

deYoung, B., M. Barange, G. Beaugrand, R. Harris, R.I. Perry, M. Scheffer and F. Werner (2008) Regime shifts in marine ecosystems: detection, prediction and management. *Trends in Ecology and Evolution*, 23:402-409. (doi:10.1016/j.tree.2008.03.008)

Rose, K.A., Megrey, B.A., Hay, D., Werner, F., Schweigert, J. (2008) Climate regime effects on Pacific herring growth using coupled nutrient-phytoplankton-zooplankton and bioenergetics models. *Transactions of the American Fisheries Society*, 137:278-297.

Cowen, R.K., G. Gawarkiewicz, J. Pineda, S.R. Thorrold, F.E. Werner. 2007. Population connectivity in marine systems: An Overview. *Oceanography* 20(3):14-21.

Werner, F.E., R.K. Cowen, C. Paris. 2007. Coupled biological and physical models: Present capabilities and necessary developments for future studies of population connectivity. *Oceanography* 20(3): 54-69.

Edwards, KP, J.A. Hare, F.E. Werner and H. Seim (2007) Using 2-dimensional dispersal kernels to identify the dominant influences on larval dispersal along continental shelf regions: A case-study along the U.S. southeast coast. *Mar. Ecol. Prog. Ser.*, 352:77-87.

Aretxabaleta, A., B.O. Blanton, F.E. Werner, E.P. Chassignet, H.E. Seim, and J.R. Nelson (2007) Cold Event in the South Atlantic Bight During Summer of 2003: Model Simulations and Implications. *J. Geophysical Research*, 112, C05022, doi:10.1029/2006JC003903.

Greenberg, D.A., F. DuPont, F. Lyard, D.R. Lynch and F.E. Werner (2007) Resolution issues in numerical models of oceanic and coastal circulation. *Continental Shelf Research*, 27(9), pp. 1317-1343.

Megrey, B.A., K.A. Rose, S. Ito, D.E. Hay, F.E. Werner, Y. Yamanaka and M.N. Aita (2007) North Pacific basin-scale differences in lower and higher trophic level marine ecosystem responses to climate impacts using a nutrient-phytoplankton- zooplankton model coupled to a fish bioenergetics model. *Ecological Modelling*, 202 (1-2), pp. 196-210.

Werner F.E., S. Ito, B.A. Megrey and M.J. Kishi (2007) Synthesis and Future Directions of Marine Ecosystem Models. *Ecological Modelling*, 202 (1-2), pp. 211-223.

Megrey, B.A., K.A. Rose, R. Klumb, D. Hay, F.E. Werner, D.L. Eslinger and S L. Smith (2007) A bioenergetics-based population dynamics model of Pacific herring (*Clupea harengus pallasii*) coupled to a lower trophic level nutrient-phytoplankton- zooplankton model: Description, calibration and sensitivity analysis. *Ecological Modelling*, 202 (1-2), pp. 144-164.

Kishi, M. J., M. Kashiwai, D.M. Ware, B.A. Megrey, D. L. Eslinger, F.E. Werner, M.N. Aita, T. Azumaya, M. Fujii, S. Hashimoto, D. Huang, H. Iizumi, Y. Ishida, S. Kang, G. A. Kantakov, H-C. Kim, K. Komatsu, V.V. Navrotsky, S. L. Smith, K. Tadokoro, A. Tsuda, O. Yamamura, Y. Yamanaka, K. Yokouchi, N. Yoshie, J. Zhang, Y.I. Zuenko and V.I. Zvalinsky (2007) NEMURO - A lower trophic level model for the North Pacific marine ecosystem. *Ecological Modelling*, 202 (1-2), pp. 12-25.

Rose, K.A., B.A. Megrey and F.E. Werner (2007) Calibration of the NEMURO nutrient-phytoplankton-zooplankton food web model to a coastal ecosystem: Evaluation of an automated calibration approach . *Ecological Modelling*, 202 (1-2), pp. 38-51.

Rose, K.A., F.E. Werner, B. A. Megrey, M. Noguchi Aita, Y. Yamanaka and D. Hay, J.F. Schweigert, and M.B. Foster (2007) Simulated herring growth responses in the Northeastern Pacific to historic temperature and zooplankton conditions generated by the 3-dimensional NEMURO nutrient-phytoplankton-zooplankton model. *Ecological Modelling*, 202 (1-2), pp. 184-195.

- Morales-Zárate, M.V. A.L. Aretxabaleta, F.E. Werner and S.E. Lluch-Cota (2006) Modelación de la circulación invernal y la retención de partículas en el sistema lagunar Bahía Magdalena-Almejas (Baja California Sur México). *Ciencias Marinas*, Vol. 32, 631-647.
- Lehodey, P., J. Alheit, M. Barange, T. Baumgartner, G. Beaugrand, K. Drinkwater, J-M. Fromentin, S.R. Hare, G. Ottersen, R.I. Perry, C. Roy, C.D. van der Lingen and F. Werner (2006) Climate variability, fish and fisheries. *J. Climate*, Vol. 19, 5009-5030.
- Lough, R.G., E.A. Broughton, L.J. Buckley, L.S. Incze, K.P. Edwards, R. Converse, A. Aretxabaleta, F.E. Werner (2006) Modeling growth of Atlantic cod larvae on the southern flank of Georges Bank in the tidal-front circulation during May 1999, *Deep-Sea Res. II.*, Vol. 53, 2771-2788.
- Edwards, K.P., F.E. Werner and B.O. Blanton (2006) Comparison of observed and modeled drifters in coastal regions: an improvement through adjustments for observed drifter slip and errors in wind fields. *J. Atmos. Ocean. Tech.*, Vol. 23, pp. 1614-1620.
- Edwards, K.P., J.A. Hare, F.E. Werner and B.O. Blanton (2006) Lagrangian circulation on the Southeast U.S. Continental Shelf: implications for larval dispersal and retention. *Continental Shelf Research* Vols. 12-13, 1375-1394.
- Aretxabaleta A., J. R. Nelson, J. O. Blanton, H. E. Seim, F. E. Werner, J. M. Bane, R. Weisberg (2006), Cold event in the South Atlantic Bight during summer of 2003: Anomalous hydrographic and atmospheric conditions, *J. Geophys. Res.*, 111, C06007, doi:10.1029/2005JC003105.
- Redfern, J.V., M.C. Ferguson, E.A. Becker, K.D. Hyrenbach, C. Good, J. Barlow, K. Kaschner, M.F. Baumgartner, K.A. Forney, L.T. Ballance, P. Fauchald, P. Halpin, T. Hamazaki, A.J. Pershing, S.S. Qian, A. Read, S.B. Reilly, L. Torres and F. Werner (2006). Techniques for Cetacean-Habitat Modeling: A Review. *Marine Ecological Progress Series*, 310:271-295.
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- Bogazzi, E., A. Baldoni, A. Rivas, P. Martos, R. Reta, J.M. Orensanz, M. Lasta, P. Dell'Arciprete and F.E. Werner (2005) Spatial correspondence between areas of concentration of Patagonian scallop (*Zygochlamis patagonica*) and frontal systems in the southwestern Atlantic. *Fisheries Oceanography*, 14:359-376.
- Lough, R.G., L.J. Buckley, F.E. Werner, J.A. Quinlan and K.A. Pehrson Edwards (2005) A general biophysical model of growth of larval Atlantic cod, *Gadus morhua*, on Georges Bank. *Fisheries Oceanography*, 14:4, 241-262.
- deYoung, B., M. Heath, F. Werner, F. Chai, B. Megrey and P. Monfray (2004) Challenges of Modeling Decadal Variability in Ocean Basin Ecosystems. *Science*, 4 June 2004, 304:1463-1466.
- Werner, F.E., A. Aretxabaleta and K. Pehrson-Edwards (2004) Modeling marine ecosystems and their environmental forcing. In: *Marine Ecosystems and Climate Variation*, edited by Stenseth, Ottersen, Hurrell and Belgrano. UK: Oxford Univ Press, pp. 33-46.
- Aretxabaleta, A., J. Manning, F.E. Werner, K. Smith, B.O. Blanton and D.R. Lynch (2004) Hindcasting May 1999 on the Southern Flank of Georges Bank: frontal circulation and implications. *Continental Shelf Research*, 25 (7/8), 849-874, 2004.

Blanton, B.O., F.E. Werner, H.E. Seim, R.A. Luettich, D.R. Lynch, K.W. Smith, G. Voulgaris, F.M. Bingham and F. Way (2004) Barotropic tides in the South Atlantic Bight. *J. Geophys. Research*, **109**, C12024, 3264, doi:10.1029/2004JC002455.

Ito S., M. J. Kishi, Y. Kurita, Y. Oozeki, Y. Yamanaka, and B. A. Megrey, and F. E. Werner (2004) Initial design for a fish bioenergetics model of Pacific saury coupled to a lower trophic ecosystem model. *Fisheries Oceanography*, Vol. 13 (Supplement 1), pp. 111-124.

Runge, J.A., P.J.S. Franks, W.C. Gentleman, B.A. Megrey, K.A. Rose, F.E. Werner and B. Zakardjian. (2004) Diagnosis and prediction of variability in secondary production and fish recruitment processes: developments in physical-biological modelling. Chapter 13, In *The Global Coastal Ocean: Multi-Scale Interdisciplinary Processes*, *The Sea*: Vol. 13, 413-473.

Lynch, D., K. Smith, B. Blanton, F. Werner and R. Luettich (2004) Forecasting the Coastal Ocean: Resolution, Tide, and Operational Data in the South Atlantic Bight. *J. Atmos. Oceanic Technology*, **21**(7):1074-1085.

Seim, H., R. Bacon, C. Barans, M. Fletcher, K. Gates, R. Jahnke, E. Kearns, R. Lea, M. Luther, C. Mooers, J. Nelson, D. Porter, L. Shay, M. Spranger, J. Thigpen, R. Weisberg and F. Werner (2003) SEA-COOS - A Model for a Multi-State, Multi-Institutional Regional Observation System. *MTS (Marine Technology Society) Journal*, vol. 37, no. 3, 92-101.

Blanton, B.O., A. Aretxabaleta, F.E. Werner and H. Seim (2003) Monthly climatology of the continental shelf waters of the South Atlantic Bight. *J. Geophysical Res.*, Vol. 108, No. C8, 3264, 15 August 2003, doi:10.1029/2002JC001609.

Werner, F.E., and Quinlan, J.A. (2002) Fluctuations in marine fish populations: physical processes and numerical modeling. *ICES Marine Science Symposia*, **215**:264-278.

Werner, F.E. and B.O. Blanton (2001) Coastal Ocean Models. In: *Encyclopedia of Ocean Science*; Steele, Turekian and Thorpe, eds., Harcourt Press, 472-480.

Werner F.E., J.A. Quinlan, R.G. Lough and D.R. Lynch (2001) Spatially-explicit individual based modeling of marine populations: a review of the advances in the 1990s. *Sarsia*, **86**:411-421.

Lynch, D.R., C.E. Naimie, J. Ip, C. Lewis, F.E. Werner, R.A. Luettich, Jr., B.O. Blanton, J.A. Quinlan, D. McGillicuddy, J. Ledwell, J. Churchill, V. Kosnyrev, C. Davis, S. Gallagher, C. Ashjian, R.G. Lough, J. Manning, C. Flagg, C. Hannah and R.Groman (2001) Real-Time Data Assimilative Modeling on Georges Bank, *Oceanography*, **14**:65-77.

Werner, F.E., B.R. MacKenzie, R.I. Perry, R.G. Lough, C.E. Naimie, B.O. Blanton and J.A. Quinlan (2001) Larval trophodynamics, turbulence, and drift on Georges Bank: a sensitivity analysis of cod and haddock. *Scientia Marina*, **65**, (Suppl. 1), 99-115.

Lynch, D.R., C.V.W. Lewis and F.E. Werner (2001) Can Georges Bank Larval Cod Survive on a Calanoid Diet? *Deep Sea Research II*, **48**:609-630

Carlotti, F., J. Giske and F.E. Werner (2000) Modeling zooplankton dynamics. In: *ICES Zooplankton Methodology Manual*, Edited by: R.P. Harris, P.H. Wiebe, J. Lenz, H.R. Skjoldal and M. Huntley, Academic Press, 571-667.

Churchill, J.H., J.O. Blanton, J.L. Hench, R.A. Luettich, Jr. and F.E. Werner (1999) Flood tide circulation near Beaufort Inlet, North Carolina: Implications for Larval Recruitment. *Estuaries*, **22**:1057-1070.

Stegmann, P.M., J.A. Quinlan, F.E. Werner, B.O. Blanton and P. Berrien (1999) Atlantic menhaden recruitment to a southern estuary: defining potential spawning regions. *Fisheries Oceanography*, **8**, (Suppl. 2), 111-123.

Werner, F.E., B.O. Blanton, J.A. Quinlan and R.A. Luettich, Jr. (1999) Physical oceanography of the North Carolina continental shelf during the Fall and winter seasons: implications to the transport of larval menhaden. *Fish. Oceanogr.*, **8**, (Suppl. 2), 7-21.

Blanton, J.O., F.E. Werner, A. Kapolnai, B.O. Blanton, D. Knott and E.L. Wenner (1999) Wind-generated transport of fictitious passive larvae into Shallow tidal estuaries. *Fish. Oceanogr.*, **8**, (Suppl. 2), 210-223.

Quinlan, J.A., B.O. Blanton, T.J. Miller and F.E. Werner (1999). From spawning grounds to the estuary: using linked individual-based and hydrodynamic models to interpret patterns and processes in the oceanic phase of Atlantic menhaden *Brevoortia tyrannus* life history. *Fish. Oceanogr.*, **8**, (Suppl. 2), 224-246.

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Luettich, R.A., Jr., J. Hench, C. Williams, F.E. Werner, B.O. Blanton (1999) Barotropic Tidal and Wind Driven Larval Transport in the Vicinity of a Barrier Island Inlet. *Fish. Oceanogr.*, **8**, (Suppl. 2), 190-209.

Checkley, D.M., Jr., P.B. Ortner, F.E. Werner, L.R. Settle and S.R. Cummings (1999) Spawning habitat of the Atlantic menhaden in Onslow Bay, North Carolina. *Fish. Oceanogr.*, **8**, (Suppl. 2), 22-36.

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Greenberg, D.A., F.E. Werner and D.R. Lynch (1998) A Spherical-Polar Coordinate Version of a Linearized Three-Dimensional Finite Element Ocean Model. *J. Atmos. Oceanic Technology*, **15**:942-958.

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Walters, R.A. and F.E. Werner (1991) Nonlinear generation of overtides, compound tides, and residuals. *Tidal Hydrodynamics*, B. Parker, editor, J. Wiley & Sons, 297-320.

Lynch, D.R. and F.E. Werner (1991) Three-dimensional velocities from a finite element model of English Channel/Southern Bight Tides. *Tidal Hydrodynamics*, B. Parker, editor, J. Wiley & Sons, 183-200.

Lynch, D.R. and F.E. Werner (1991) Three-dimensional hydrodynamics on finite elements. Part II: nonlinear time-stepping model. *International Journal for Numerical Methods in Fluids*, **12**:507-533.

Johnsen, M.T., K. Paulsen and F.E. Werner (1991) Radiation boundary conditions for finite element solutions of the wave and telegraph equations. *Intl. Journal for Numerical Meths. in Fluids*, **12**:765-783.

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Walters, R.A. and F.E. Werner (1989) A comparison of two finite element models using the North Sea data set. *Advances in Water Resources*, **12**:184-193.

Werner, F.E. and D.R. Lynch (1989) Harmonic structure of English Channel/southern Bight tides from a wave equation simulation. *Advances in Water Resources*, **12**:121-142.

Werner, F.E., A. Cantos-Figuerola and G. Parrilla (1988) A sensitivity study of reduced-gravity channel flows with application to the Alborán Sea. *Journal of Physical Oceanography*, **18**:373-383.

Werner, F.E. and D.R. Lynch (1987) Field verification of wave equation tidal dynamics in the English Channel and southern North Sea. *Advances in Water Resources*, **10**:115-130.

Lynch, D.R. and F.E. Werner (1987) Three-dimensional hydrodynamics on finite elements. Part I: linearized harmonic model. *Int'l Journal for Numerical Methods in Fluids*, **7**:871-909.

Werner, F.E. (1987) A numerical study of secondary flows over continental shelf edges. *Continental Shelf Research*, **7**:379-409.

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Werner, F.E. and B.M. Hickey (1983) The role of a longshore pressure gradient in Pacific Northwest coastal dynamics. *Journal of Physical Oceanography*, **13**:395-410.

## **APPENDIX**

### **Sponsored Research**

NSF (2011-2015): A CRI-EaSM Collaborative proposal: Climate-to-humans: A study of urbanized coastal environments, their economics and vulnerability to climate change. (\$3M) PIs: E. Curchister, N. Fefferman, F. Felder, Y-F. Reinfelder and F.E. Werner.

NOAA: Cooperative Institute for the North Atlantic Region (CINAR); 2009-2013. Woods Hole Oceanographic Institution (D. Anderson), Rutgers University (F. Werner), University of Maryland Center for Environmental Studies (M. Roman), University of Maine (P. Jumars) and Gulf of Maine Research Institute (J. Annala). Funding levels still to be determined.

NOAA-NSF CAMEO: Building the Foundation: Mechanisms for Low-Frequency Variability of Forage Fish: A Comparative Analysis of North Pacific Sardine Systems, (\$300,000) E. Curchitser, PI, F. Werner, D. Checkley, C. Edwards, J. Fiechter, K. Rose, B. Megrey, A. MacCall.

NSF MRI (DMS-0619665): A modular wave tank for fundamental and applied research in the new UNC Multiscale Fluid Dynamics Lab, \$619,607. R. Camassa, P.I., F. Werner, R. McLaughlin and A. Scotti, co-PIs (2006-2009).

NSF: US GLOBEC (2006-2008) - Factors determining recruitment variability in North Atlantic cod: a comparison between the NW Atlantic and Norwegian Sea Systems, \$412,000. (With G. Lough & E. Durbin)

Asian-Pacific Network (APN): Climate Interactions and Marine Ecosystems: Effects of Climate on the Structure and Function of Marine Food-Webs and Implications for Marine Fish Production in the North Pacific Ocean and Marginal Seas (with B. Megrey) \$45,000.

U.S. GODAE: Global Ocean Prediction with the Hybrid Coordinate Ocean Model (HYCOM). E. Chassignet, PI. F. Werner et al., co-PIs. UNC-CH: \$345,000. Oct 2004-June 2009.

ONR N0014-021-0972 (2002-2005): Southeast Atlantic Coastal Ocean Observing System, initial implementation. H. Seim, PI, F. Werner et al, co-PIs, in collaboration with SkIO, UCS, UM and USF. Total approx: \$14M; \$UNC-CH approx: \$3M.

NASA/National Ocean Partnership Program (NAG13-00041): Limited-area operational coastal ocean models: Assimilation of observations from fixed platforms on the continental shelf and far-field forcing from open ocean models. DR Lynch et al (Dartmouth), F.E. Werner et al (UNC), W. Youngblood (NCSC), D. McGillicuddy (WHOI), P. Welsh et al (NWS). 7/00-6/03, \$1,498,547. UNC-CH: \$442,000.

NSF: US GLOBEC (OCE 9806565): Productivity of *Calanus finmarchicus* and fluctuations in growth and survival of cod and haddock larvae on Georges Bank: A synthesis of observations and modeling. October 1998-September 2001. \$264,917 (F. Werner, PI).

NOAA/NSF: US GLOBEC (NA-06 0P0078): Real-time data assimilation on Georges Bank. October 1998-September 2001. \$107,000 (F. Werner, PI).

NOPP (National Oceanographic Partnership Program, N00014-98-1-0786): South Atlantic Bight Synoptic Offshore Observational Network. 7/98-6/00. \$275,938 (UNC component), F. Werner and J. Bane, co-PIs.

ONR, Office of Naval Research (N00014-97-1-0500: Observations and Numerical Simulations of Western Boundary Current Impact on Cape Hatteras, NC; \$159,569, J. Bane and F. Werner, co-PIs.

NSF: US GLOBEC (OCE 9634171, NA 36GP055): Importance of Physical and Biological Processes to Population Regulation of Cod and Haddock in Georges Bank: A Model-Based Study. Oct '96 - Sep '99. Award to UNC: \$258,000 (with D. Lynch, C. Naimie, J. Loder, P. Smith, F. Page, *et al.*).

NOAA 1997-1998: SABRE (S. Atlantic Bight Recruitment Expt), Phys. & Biol. Modeling. \$20,000.

NOAA 1995-1997: SABRE (S. Atlantic Bight Recruitment Expt), Phys. & Biol. Modeling. \$182,000.

NSF/NOAA: US GLOBEC: Importance of Physical and Biological Processes to Population Regulation of Cod and Haddock in Georges Bank: A Model-Based Study. 7/1993 – 6/1996. Award to UNC: \$199,000 (with D. Lynch, D. Greenberg, J. Loder, G. Lough, F. Page, I. Perry, P. Smith, W. Smith and M. Sinclair).

National Oceanic and Atmospheric Administration 1993-1995 (NA16RG0481): SABRE (S. Atlantic Bight Recruitment Expt.), Physical Oceanography and Modeling. Award to UNC: \$150,000. (With J. Blanton).

Office of Naval Research: Effects of variation of bed roughness on three dimensional circulation models of tidally dominated continental shelves. July 1993 - June 1994, \$32,000 (with T. Gross).

National Oceanic and Atmospheric Administration 1991-1993 (NA16RG0481): SABRE (South Atlantic Bight Recruitment Experiment), Physical Oceanography and Modeling. Award to Skidaway: \$116,000. (With L. Atkinson, J. Blanton, P. Verity and T. Lee).

National Science Foundation: (Ocean Sciences, GLOBEC), 1991-1993 (OCE-9016825): Development of Quantitative, Hydrodynamic and Biological Models of Settlement of Planktonic Larvae of Benthic Animals. Award: \$324,993. (With J. Eckman and T. Gross)

Office of Naval Research 1991-1992 (N00014-91-J-1376): Residual Flows Induced by Variation of Bed Roughness on Continental Shelves. Award: \$113,000. (With T. Gross)

National Science Foundation (Ocean Sciences, GLOBEC), 1991-1992: Significance of Circulation to Egg and Larval Distributions on Georges Bank. Award to Skidaway: \$57,000. (With D. Lynch, D. Greenberg, J. Loder and I. Perry)

NSF (Physical Oceanography), 1990-1992 (OCE-9018387): Synthesis of Numerical and Field Studies of a Coastal Ocean: The Gulf of Maine System. Award to Skidaway: \$205,000. (With D. Lynch)

New Hampshire Sea Grant, 1989-1991 (R/FMD-110): A study of the tides and the 3-dimensional flow structure in the Gulf of Maine. Award: \$19,950. (With D. Lynch)

National Science Foundation (under U.S.-Latin American Cooperative Science Program), 1986-1988 INT-8514156): A numerical study of an ocean-strait-inland sea system: the Lake Maracaibo system. Award: \$29,990. (With D. Lynch.)

U.S. Department of State (under U.S.-Spain Joint Committee for Scientific and Tech. Cooperation) 1985-1987 (CCA-8411-047): Finite element computations of the currents in the Alborán Sea. Award to US counterpart: \$34,544. (With D. Lynch.)

**Additional Professional Service:**

GLOBEC-INT Scientific Steering Committee: member, 1999-2010.  
PICES Climate Change and Carrying Capacity Implementation Panel: member, 2001-2007.  
PICES MODEL Task Team: Co-chair, 2001-2007.  
International Council for the Exploration of the Seas (ICES) Cod and Climate Change (CCC) Working Group: member, 1995-2002.  
Gordon Research Conference on Coastal Circulation Modeling: Vice-Chair, 2003.  
Modeling and Predictive Capabilities (Focus 3) Working Group of GLOBEC-INT: chair, 1999-2003.  
SURA (Southeast Univ. Research Assoc.) Committee on Coastal Research: member, 1999-2002.  
Scientific Steering Group of the ICES/NAFO Decadal Symp. of the 1990s: member, 1999-2001.  
Program Management Committee of the NOAA Coastal Ocean Program South Atlantic Bight Recruitment Experiment (SABRE): member, 1994-1999.  
European Union Committee to draft Science Plan for EU Global Ecosystem Dynamics (EU GLOBEC): member, 1997.  
Session Co-convenor: AGU/ASLO/TOS Special Session on Population Connectivity, Hawaii, Feb. 2006; TOS Session on Population Connectivity, Paris, June 2005; PICES XIII Annual Science Meeting, Honolulu, Hawaii, Oct. 2004; PICES XII Annual Science Meeting, Seoul, Korea, Oct. 2003; ICES Statutory Meeting, Stockholm, Sweden, Oct. 1999; ICES Statutory Meeting Aalborg, Denmark, Sept. 1995.  
Session Chair, Coastal and Estuarine Processes, American Geophysical Union, Dec. 1990.  
Workshop co-convenor for the Third Backward Facing Workshop on the 1960's cod and haddock year-classes of the NW Atlantic Shelf. Woods Hole, MA, May 1998.

**Journal reviews:** Proc. Nat. Acad. Sci., J. Phys. Oceanogr., J. Atmos. Oceanic Tech., J. Mar. Res., J. Mar. Sys., Continental Shelf Res., Estuarine, Coastal and Shelf Science, Fisheries Oceanography, Limnology and Oceanogr., Ecological Modelling, Oceanologica Acta, Adv. Water Resources, Int. J. for Num. Meths. in Fluids, Int. J. for Numerical Meths. in Eng., Comm. in Appl. Num. Meths., Progress in Oceanography, Water Resources Research, Métodos Numéricos para Cálculo y Diseño en Ingeniería, J. Geophys. Res., Atmosphere-Ocean, and Computer-Aided Engg. & Software.

**Proposal reviews:** U.S. National Science Foundation; NOAA; Georgia, Maine, North Carolina and Virginia Sea Grant Offices; U.S. Dept. of the Interior, National Park Service; Comisión Interministerial de Ciencia y Tecnología (Spain), Chilean CONY CET, Norwegian National Res. Council; UK National Res. Council.

**Field Experience:** Various cruises off the Washington-Oregon coast, 1980-1983. Hydrographic casts and current meter deployment and recovery. Real time circulation forecasting on R/V Link April/May 1999 (Georges Bank).

**UNC-CH Service:**

Chairman, Department of Marine Sciences, July 1 2000-2007  
Acting Chairman, Department of Marine Sciences, July - Oct 1996; May - Dec 1997.  
Member, Core Group Science Complex Phases I and II (2002-present); Carolina Speakers (1995-present); UNC-System Marine Sciences Advisory Board (June 1998-present); McNair speakers selection committee (2002-present); Faculty Council (July 1998-July 2001); Advisory Board for the Institute of Latin American Studies (1994-1997); UNC-CH Science Library Planning Committee (July 1998-Dec 1998); UNC-CH Research Council (Fall 1998-Fall 1999); A&S Science Advisory Group (July 1998-July 2000); Committee

on Curriculum for the BS/BA in Env. Sciences/Studies (1997-2000); Marine Sciences Admissions Committee (1993-2000); Chair of the Marine Sciences Curriculum Strategic Planning Committee (1997) Search Committee Member: Chair of Environmental Sciences and Engineering Dept (1998-1999); Assistant Dean for First Year Programs (2003).

### **Teaching:**

*University of North Carolina at Chapel Hill (1993-present)*

General Oceanography (Fall '93, '95, Spring '95, '97, '02)

Coastal Circulation Theory (Fall '94, '96, '98)

Ocean Circulation Theory (Spring '98)

Advanced Ocean Circulation Modeling (Spring '94, Fall '95, '97)

Modeling of Marine Systems (Spring '95, '96, '97, '99)

Biological Processes and Physical Forcings (Spring '96)

First Year Seminar "Where did all the fish go?" (Fall '01, '02, '03, '04, '05, '06)

*Universidad de las Islas Baleares, Physics Department (Winter 1991):* Turbulence and Boundary Layers (Continuum Mechanics)

*Thayer School of Engineering, Dartmouth College (1985-1989):* Advanced Numerical Methods; Geophysical Fluid Dynamics; Radiation Boundary Conditions

*University of Washington:* Teaching Assistant for General Physical Oceanography, Quantitative Methods in Oceanography and for Simulation Analysis of Marine Systems.

### **Post-Doctoral Associates, Student PhD and MSc Committees**

*University of North Carolina*

Post-Doctoral Associate: A. Kapolnai, T. Kristiansen, J. Solé

PhD: J.A. Quinlan (Committee Chair), B.O. Blanton (Committee Chair), A. Aretxabaleta (Committee Chair); K. Edwards (Committee Chair) J. Fleming, J. Hensch, S. Carr, D.K. Savidge,

MSc: M.A. García (Committee Chair), K. Edwards (Committee Chair), M.A. Neaton,

*Dartmouth College*

PhD: C.E. Naimie, M.T. Johnsen, M. Holboke (Committee Member)

MSc: L. Gibson, G. Sidén, and J. McEntee (Committee Member)

*Duke University*

PhD: Jaime Palter, R. Schick, Taichi Sakagami

*Centro de Investigaciones Biológicas del Noroeste, (CIBNOR), Baja California, México*

MSc and PhD: Verónica Morales Zárata (Committee Member)

### **Technical Reports**

Wiebe, P.H., R.P. Harris, M.A. St. John, F.E. Werner, B. de Young and P. Pepin (Eds.). 2009. BASIN: Basin-scale Analysis, Synthesis, and INtegration. Science Plan and Implementation Strategy. GLOBEC Report 27: iii, 43pp.

Wiebe, P.H., R.P. Harris, M.A. St. John, F.E. Werner and B. de Young. (Eds.). 2007. BASIN. Basin-scale Analysis, Synthesis, and INtegration. GLOBEC Report 23 and U.S. GLOBEC Report 20. 1-56pp

Cowen, R.K., G. Gawarkiewicz, J. Pineda, S. Thorrold and F. Werner (2004) Population Connectivity in Marine Ecosystems. Report of a Workshop to develop science recommendations for the National Science Foundation; 22 pp.

Megrey, B.A., Rose, K.A, Werner, F.E., Klumb, R.A., Hay, D. (2002) A Generalized Fish Bioenergetics/Biomass Model with an Application to Pacific herring, pp. 80 to 88. In: 2001 BASS/MODEL, MONITOR and REX Workshops, and the 2002 MODEL/REX Workshop. H.P. Bachelder, G.A. McFarlane, B.A. Megrey, D.L. Makas, W.T. Peterson (editors). PICES Scientific Report, August 2002, No. 20. 176pp.

Megrey, B.A., M.J. Kishi, M.B. Kashawai, D. Ware, F.E. Werner, D.L. Eslinger (2000) Model Task Team Workshop Report: Final Report of the International Workshop to Develop a Prototype Lower Trophic Level Ecosystem Model for Comparison of Different Marine Ecosystems in the North Pacific. PICES Scientific Report No. 15:1-78

Report of the Workshop on "Ocean Climate of the NW Atlantic of the NW Atlantic During the 1960s and 70s and Consequences for Gadoid Populations" (1999) co-authored by F. Werner, K. Brander and S. Murawksi. ICES Cooperative Research Report No. 234, ISSN 1017-6195, 81pp.

Report of the ICES Third Backward Facing Workshop, "Ocean Climate of the NW Atlantic during the 1960s and 70s and Consequences for Gadoid Populations" (1998) co-authored by F. Werner, K. Brander and S. Murawksi. (<http://www.ices.dk/reports/occ/wkbfac98.doc>)

Northwest Atlantic Cod and Climate Change Working Group. Report on "Cod and Climate Change Related Research Programs in the United States and Canada." (1995)

Werner, F.E. and D.R. Lynch. Tides in the southern North Sea/English Channel: data files and procedure for reference computations (1998). Numerical Methods Laboratory, Thayer School of Engineering, Dartmouth College, February 1988; 26pp + 2 diskettes with software.

### **Proceedings, Notes and Newsletter Articles**

Cowen, R.K., S. Thorrold, J. Pineda, G. Gawarkiewicz and F. Werner (2007) Population connectivity in marine systems: an overview. *Oceanography* **20**(3):16-23.

Kishi, M.J., B.A., Megrey, S. Ito (2007) In Memoriam, Dan Ware. *Ecological Modelling*, doi:10.1016/j.ecolmodel.2006.10.001.

Kishi, M.J., B.A., Megrey, S. Ito (2007) Preface to the Ecological Modelling special issue on the NEMURO model. *Ecological Modelling*, 202 (1-2), pp. 3-6

Werner, F.E., B.A. Megrey, and K.A. Rose (2005). Report of the APN workshop on "Climate interactions and marine ecosystems." *PICES Press*, Vol. 12, No. 2, pp. 15-17.

Barange, M., F. Werner, R.I. Perry and M. Fogarty (2003) The tangled web: global fishing, global climate, and fish stock fluctuations. *IGBP Newsletter*, No. 56, Dec. 2003, pp24-27.

Werner, F.E. (2003) Introduction to GLOBEC. *GLOBEC Newsletter*, April, vol. 9, no. 1, pp. 1-2.

Cowen, R.K., S. Thorrold, J. Pineda, G. Gawarkiewicz and F. Werner (2003) Workshop held to discuss population connectivity in marine systems. *EOS* **84**(13):119.

Seim, H., F. Werner, M. Fletcher, J. Nelson, R. Jahnke, C. Mooers, L. Shay, R. Weisberg and M. Luther (2002) SEA-COOS: Southeast Atlantic Coastal Ocean Observing System, Proceedings of Oceans 2002, IEEE/MTS, October, 2002.

Werner, F.E. and S.E. Lluch-Cota (2002) Course on Coupling Physical Circulation Models and Individual Based Models held in La Paz, Mexico. *GLOBEC Newsletter*, October, vol. 8, no. 2, pp. 29-30.

Megrey, B.A., M.J. Kishi, D. Hay, S. Ito, R.A. Klumb, K. Rose and F.E. Werner (2002) Report of the 2002 PICES MODEL/REX Task Team Workshop to Develop a Marine Ecosystem Model of the North Pacific Ocean Including Pelagic Fishes: NEMURO.FISH. *GLOBEC Newsletter*, October, vol. 8, no. 2, pp. 25-27.

Heath, M., B. De Young, Ø. Fiksen and F.E. Werner (2001) Secondary Production in the Oceans and the Response to Climate Change. *IGBP Newsletter*, No. 47, 9-12.

Kishi, M.J., Megrey, B.A., Eslinger, D., Rose, K.A., Ware, D.M., Werner, F.E. (2001) Report of the 2001 PICES MODEL Task Team workshop on strategies for coupling higher and lower trophic level marine ecosystem models: status of the LTL model. *GLOBEC Newsletter* **7**(1): 3-6.

Megrey, B.A., Kishi, M.J., Kashiwai, M., Ware, D.M., Eslinger, D.L., Werner, F.E. (2000) PICES Lower trophic level modeling workshop, Nemuro. *PICES Press* **8**(2): 18-22.

Werner, F.E. R.G. Lough, J.A. Quinlan, L.J. Buckley, E. Durbin, L.S. Incze and J.A. Runge (2000) Modeling growth of larval cod and haddock on Georges Bank: a synthesis of observations and model results for spring, 1995. *ICES C.M. 2000/M:24*, 9pp.

Runge, J.R., J.A. Quinlan, E. Durbin, F. Werner, G. Lough, L. Buckley, E. Calderone, L. Incze, J. Manning, D. Mountain, B. Niehoff and S. Plourde (2000) The effect of spatial and temporal variation in zooplankton concentrations on larval cod growth and survival on Georges Bank: a sensitivity analysis based on modelling and observations. *ICES C.M. 2000/M:17*, 11pp.

Davis, C.S., M.C. Benfield, P.H. Wiebe, S.M. Gallagher, C.H. Greene, F.E. Werner and T.K. Stanton (1999) Real-time image analysis: instrument to model. *ICES Annual Science Conference*, September 1999, Stockholm, Sweden. *ICES C.M. 1999/M:06*.

Incze, L.S., F.E. Werner, N. Wolff and F. Dye (1999) Direct and indirect effects of wind-induced turbulence on larval cod feeding: results of a 1-D model for Georges Bank. *ICES Annual Science Conference*, September 1999, Stockholm, Sweden. *ICES C.M. 1999/K:07*.

Gross, T.F. and F.E. Werner (1997) Finite Element Model of Wassaw Sound with Synthetic Marsh Flooding Boundary Conditions. 5th Inter. Conf. on Estuarine and Coastal Modeling, Alexandria, VA, USA, October 22-24, 1997.

Luettich, R.A. Jr., J.L. Hench, C.D. Williams, B.O. Blanton, F.E. Werner (1997) Tidal circulation and larval transport through a barrier island inlet. 5th Inter. Conf. on Estuarine and Coastal Modeling, Alexandria, VA, USA, October 22-24, 1997.

Quinlan, J.A., F.E. Werner, S. Gallager, R.G. Lough and L.J. Buckley (1997) Modeling the role of microzooplankton grazing in the feeding environment of yolk-sac cod larvae. ICES Annual Science Conference, 25-30 September 1997, Baltimore, MD, USA. ICES C.M. 1997/T:15.

Werner, F.E., R.I. Perry, B.R. MacKenzie, R.G. Lough and C.E. Naimie (1995) Larval Trophodynamics, Turbulence, and Drift on Georges Bank: A Sensitivity Analysis of Cod and Haddock. ICES Annual Science Conference, 21-26 September 1995, Aalborg, DENMARK, ICES C.M. 1995/Q:26.

Werner, F.E. (1995) Importance of Physical and Biological Processes to Population Regulation of Cod and Haddock on Georges Bank: A Case Study. In: *Proceedings of the Conference on Environmental Impact Prediction*. Research Triangle Park, NC, 6-7 October 1994, 243-256.

Werner, F.E., R.I. Perry, R.G. Lough and D.R. Lynch (1994) A Coupled Individual-Based Trophodynamics and Circulation Model for Studies of Larval Cod and Haddock on Georges Bank. In: *U.S. GLOBEC News*, no. 7, September 1994.

Lynch, D.R., J.T.C. Ip, E.M. Wolff and F.E. Werner (1994) Comprehensive Circulation Model for the Gulf of Maine. In: *Gulf of Maine Circulation Modeling: Workshop Proceedings*, RARGOM Report 94-1, Brasch E., Ed., October 1993, Dartmouth College, Hanover, NH, 50-66.

Greenberg, D.A., D.R. Lynch and F.E. Werner (1990) Finite element models for continental shelf circulation. In: *Ocean Waves Mechanics, Computational Fluid Dynamics and Mathematical Modeling*. Proceedings of the 11th International Annual Conference of the Canadian Applied Mathematics Society, May 29-June 1, 1990, Halifax, Nova Scotia, Canada. M. Rahman, Ed., Computational Mechanics Publications, Southampton, Boston, 727-738.

Lynch, D.R. and F.E. Werner (1989) Wave equation hydrodynamics on simple 3-D elements. In: *Proceedings of the VIIth International Conference of Finite Elements and Flow Problems*, Chung, T.J. and G.R. Karr, eds. The University of Alabama in Huntsville Press, April 1989, 1373-1382.

Lynch, D.R., F.E. Werner, A. Cantos-Figuerola and G. Parrilla (1989) Finite element modeling of reduced-gravity flow in the Alborán Sea: Sensitivity studies. In: *Conferencia sobre oceanografía física del Estrecho de Gibraltar*, 24-28 October 1988, Madrid. Edited by Almazán, J.L., H. Bryden, T. Kinder, and G. Parrilla, 283-295.

Werner, F.E. and D.R. Lynch (1988) Report on the 2nd Tidal Flow Forum. *EOS, Transactions, American Geophysical Union*, **69**:1027-1028.

Lynch, D.R. and F.E. Werner (1988) Long-term simulation and harmonic analysis of North Sea and English Channel tides. In: *Proceedings of the VIIth Int'l Conference on Finite Elements in Water Resources. Developments in Water Science*, Celia, M., et al., Eds., Elsevier. MIT, Cambridge, MA, **35**:257-266.

Walters, R.A. and F.E. Werner (1988) Experiments on the generation of tidal harmonics. In: *Proceedings of the VIIth International Conference on Finite Elements in Water Resources. Developments in Water Science*, M. Celia, et al., Eds., CMP Elsevier. MIT, Cambridge, MA, **35**:275-280.

Werner, F.E. and D.R. Lynch (1986) Field studies with the wave equation formulation. In: *Proceedings of the VIth International Conference on Finite Elements in Water Resources*, A. Sá da Costa, et al., Eds., Springer-Verlag, Lisbon (Portugal), 547-560.



Lynch, D.R. and F.E. Werner (1986) Three-dimensional harmonic model for linearized tidal circulation. In: *Proceedings of the Vith International Conference on Finite Elements in Water Resources*, A. Sá da Costa, *et al.*, Eds., Springer-Verlag, Lisbon (Portugal), 505-514.

Werner, F.E (1984) Circulation over continental shelves and shelf-break regions. In: *Proceedings of the Vth International Conference on Finite Elements in Water Resources*, J.P. Laible, *et al.*, Eds., Springer-Verlag, Burlington, VT, 385-394.

Werner, F.E. and R.A. Walters (1984) Finite element solutions of the spin-up of a rotating fluid. In: *Proceedings of the Vth International Symposium on the Finite Elements and Flow Problems*, G.F. Carey and J.T. Oden, Eds., The University of Texas at Austin, 155-159.