Contents

List of Contributors *page* vi
Preface ix
Editorial Acknowledgements xi

1 **Soil carbon relations: an overview** 1
WERNER L. KUTSCH, MICHAEL BAHN AND ANDREAS HEINEMEYER

2 **Field measurements of soil respiration: principles and constraints, potentials and limitations of different methods** 16
JUKKA PUMPANEN, BERNARD LONGDOZ AND WERNER L. KUTSCH

3 **Experimental design: scaling up in time and space, and its statistical considerations** 34
JENS-ARNE SUBKE, ANDREAS HEINEMEYER AND M. REICHSTEIN

4 **Determination of soil carbon stocks and changes** 49
MIRCO RODEGHIERO, ANDREAS HEINEMEYER, MARION SCHRUMPF AND PAT BELLAMY

5 **Litter decomposition: concepts, methods and future perspectives** 76
MIRCO FRANCESCA COTRUFO, ILARIA DEL GALDO AND DANIELA PIERMATTEO

6 **Characterization of soil organic matter** 91
KAROLIEN DENEF, ALAIN F. PLANTE AND JOHAN SIX

7 **Respiration from roots and the mycorrhizosphere** 127
FERNANDO E. MOYANO, OWEN K. ATKIN, MICHAEL BAHN, DAN BRUHN, ANDREW J. BURTON, ANDREAS HEINEMEYER, WERNER L. KUTSCH AND GERHARD WIESER

8 **Separating autotrophic and heterotrophic components of soil respiration: lessons learned from trenching and related root-exclusion experiments** 157
DANIEL EPRON

9 **Measuring soil microbial parameters relevant for soil carbon fluxes** 169
WERNER L. KUTSCH, JOSHUA SCHIMEL AND KAROLIEN DENEF

10 **Trophic interactions and their implications for soil carbon fluxes** 187
EDWARD AYRES, DIANA H. WALL AND RICHARD D. BARDGETT

11 **Semi-empirical modelling of the response of soil respiration to environmental factors in laboratory and field conditions** 207
MARKUS REICHSTEIN AND IVAN A. JANSSENS

12 **Modelling soil carbon dynamics** 221
PETE FALLOON AND PETE SMITH

13 **The role of soils in the Kyoto Protocol** 245
PETE SMITH, PETE FALLOON AND WERNER L. KUTSCH

14 **Synthesis: emerging issues and challenges for an integrated understanding of soil carbon fluxes** 257
MICHAEL BAHN, WERNER L. KUTSCH AND ANDREAS HEINEMEYER

15 **Appendix: Towards a standardized protocol for the measurement of soil CO_2 efflux** 272
MICHAEL BAHN, WERNER L. KUTSCH, ANDERAS HEINEMEYER AND IVAN A. JANSSENS

Index 281