

MINUTES

FORHOT – 9th formal project meeting

On-line

and from a following workshop entitled “Joint Ecosystem Assessment on the Effects of Natural Soil Warming and N-input Manipulation on Subarctic Grasslands and Forests” 30 June – 1 July, 2020

Attending: Altogether 56 ForHot and Future Arctic participants attended the meeting when most were on-line.

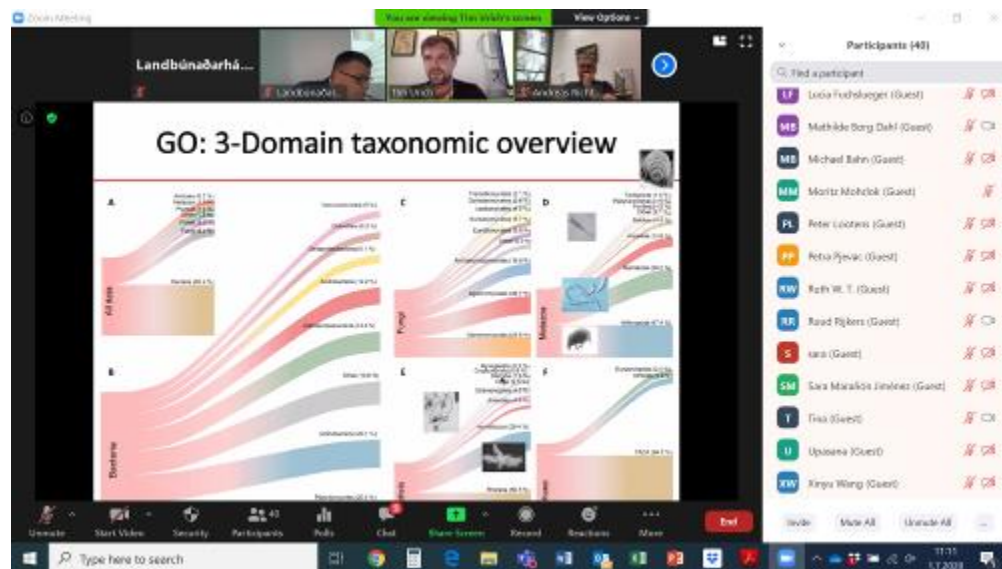


Figure 1. Snapshot from Tim Ulrick’s lecture.

Agenda of the ForHot business meeting

1. Last year’s minutes revisited
 - a. ForHot member overview
2. Happenings since last meeting
3. Synthesis work / publications
4. New ForHot partners
5. Funding news – ideas or plans
6. ForHot / FutureArctic database issues
7. Other issues
8. The ForHot 2020 conference overview

1. ForHot member overview now (2020)

The list of participants of the ForHot project during 2012-2020. Researchers active now in 2020 are in **bold/green**, but those not active are in **normal/brown**. Students who are still active in 2020 are in **bold/blue**; students or others who have finished or otherwise ended their work are in **bold/red**:

<p>Agric. Univ. of Iceland</p> <ol style="list-style-type: none"> 1. Prof. Bjarni D. Sigurdsson (coord.) 2. Páll Sigurðsson (Ph.D. student 2016-) 3. Ruth Tchana (Ph.D. student 2020-) 4. Narfi Hjartarson (BSc student 2020-) 5. Björk Kristjánsdóttir (technician 2020) <ul style="list-style-type: none"> • Antonia Lindau (internship student 2019) • Bernard Gill (internship student 2019) • Ben Wisniewski (internship student 2019) • Alice L. Sarolta Cosatti (internship student 2017) • Paige Guevarra (internship student 2017) • Julia Bischof (internship student 2017) • Gunnhildur E. G. Gunnarsdóttir (2016-2018) • Helena M. Stefánsdóttir (2011-2015) • Elín Guðmundsdóttir (M.Sc. student 2013-) • Damiano Cilio (B.S. student 2014). • Dr. Úlfur Óskarsson <p>Icelandic Forest Research – Mogilsa</p> <ol style="list-style-type: none"> 6. Dr. Edda S. Oddsdóttir <p>Svarmi ehf.</p> <ol style="list-style-type: none"> 8. M.Sc. Tryggvi Stefánsson 7. M.Sc. Sidney Gunnarson 8. Amir Hamedpour (Ph.D. student 2020-) <p>Univ. Akureyri</p> <ul style="list-style-type: none"> • Dr. Brynhildur Bjarnadóttir <p>Univ. of Iceland / Soil Conservation Service</p> <ol style="list-style-type: none"> 9. Dr. Bryndís Marteinsdóttir 10. Rán Finnsdóttir (M.Sc student 2019-2020) <ul style="list-style-type: none"> • Nia Perron (M.Sc. student 2016-2017) • Ella Thoen (B.Sc. student 2011-2012) <p>Univ. of Antwerp - Belgium</p> <ol style="list-style-type: none"> 11. Prof. Ivan Janssens 12. Prof. Erik Verbruggen 13. Dr. Joke Van den Berge 14. Dr. Eric Struyf 15. Prof. Steven Latré 16. Niel Verbrigghe (PhD student 2017-2020) 17. Johan de Gruyter (PhD student 2017-2020) 18. Coline Le Noir de Carlan (PhD student 2020...) 19. Joanna Pranga (PhD student 2020...) 20. Priyesh Puluckul (PhD student 2020...) 21. Vaidehi Narsingh (PhD student 2020...) 22. Bart Bussmann (PhD student 2020...) <ul style="list-style-type: none"> • Dr. Sara Vicca (Post-doc 2017-2019) • Dr. Lucia Fuchslueger (Post-doc 2017-2019) 	<p>Lund University</p> <ol style="list-style-type: none"> 38. Prof. Håkan Wallander 39. Prof. Erland Bååth 40. Dr. Per Bengtson 41. Jian Li (PhD student 2018...) <ul style="list-style-type: none"> • Jing Zang (PhD student 2017-2019) • Dr. Zhanfeng Liu (Postdoc 2016) • Dr. Magnus Ellström (Ph.D. student 2012) • Dr. Stephanie Reischke (Ph.D. student 2012) <p>Swedish Univ. Agric. Sci. (SLU)</p> <ol style="list-style-type: none"> 42. Prof. Thomas Kätterer <ul style="list-style-type: none"> • Dr. Monika Strömgen • Dr. Christopher Poeplau (Post-doc) • Hanna André (B.S. student 2014) • Agnes Bondesson (B.S. student 2014) <p>Örebro Univ., Sweden</p> <ol style="list-style-type: none"> 43. Prof. Alf Ekblad <p>Univ. of Tartu, Estonia</p> <ol style="list-style-type: none"> 44. Ass. Prof. Ivika Ostonen 45. Dr. Jaak Truu 46. Dr. Marika Truu 47. Dr. Martin Maddison 48. Biplabi Bhattacharai (PhD student 2019...) <ul style="list-style-type: none"> • Kaarin Parts (Ph.D. student 2014-2020) <p>EMU, Estonia</p> <ol style="list-style-type: none"> 49. Prof. Ülo Niinemets <p>Copenhagen Univ. - Denmark</p> <ol style="list-style-type: none"> 49. Prof. Per Gundersen 50. Dr. Klaus S. Larsen 51. Linsey Avila (PhD student 2020...) 52. Leena Jaakola (PhD student 2020...) <ul style="list-style-type: none"> • Anna Theresa Edlinger (M.Sc. student 2016) <p>Aarhus Univ. - Denmark</p> <ol style="list-style-type: none"> 53. Prof. Martin Holmstrup <ul style="list-style-type: none"> • Dmitry Kutcherov (Post-doc 2017-2019) <p>Univ. of Tromsø</p> <ol style="list-style-type: none"> 54. Dr. Alexander Tveit 55. Andrea Söllinger (Post-doc 2019...) <p>Univ. of Vienna - Austria</p> <ol style="list-style-type: none"> 56. Prof. Andreas Richter 57. Dr. Christina Kaiser 58. Lucia Fuchslueger (Post-doc 2020...) 59. Joana da Silva (PhD student 2018...) 60. Dennis Metze (PhD student 2020...) 61. Moritz Mohrlök (MSc student 2019...)
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<ul style="list-style-type: none"> • Chao Fang (PhD student 2018-2019) • Dr. Cindy De Jonge (Post-doc 2016-2018) • Dr. Niki Leblans (Post doc 2016-2017) • Dr. James Weedon (Post-doc) • Dr. Jennifer Soong (Post-doc) • Wendelien Meynzer (M.Sc. student 2014-) • Niki Leblans (PhD student 2012-2016) • Stephanie Van Loock (M.Sc. student 2014-2016) • Katherine Vande Velde (M.Sc. student 2014-2015) • Steven Dauwe (PhD student 2015-) • Lieven Michiels (M.Sc. student 2014-2015) • Mattias Janssens (job student 2016) • Elien de Schutter (job student 2016) • Dajana Radujkovic (M.Sc. student 2014-2016) <p>ILVO - Belgium</p> <p>23. Dr. Peter Lootens</p> <p>24. Dr. Caroline De Tender</p> <p>25. Dr. Greet Ruysschaert</p> <p>IMEC - Belgium</p> <p>26. Prof. Maarten Weyn</p> <p>27. Dr. Yorick De Bock</p> <p>Thünen Institute - Germany</p> <p>28. Dr. Christopher Poeplau</p> <p>Univ. Greifswald, Germany</p> <p>29. Prof. Tim Ulrich</p> <p>30. Dr. Mathilde Dahl (Post-doc)</p> <p>ETH-Zürich, Switzerland</p> <p>31. Dr. Tom Walker</p> <p>CzechGlobe, Czech Republic</p> <p>32. Dr. Karel Klem</p> <p>33. Dr. Otmar Urban</p> <p>Cardinal Stefan Wyszyński Univ., Poland</p> <p>32. Dr. Krassimira Ilieva-Makulec</p> <p>Vrije University, Amsterdam, NL</p> <p>33. Ass. prof. James T. Weedon</p> <p>34. Ruud Rijkers (PhD student 2018-...)</p> <ul style="list-style-type: none"> • Benjamin Hearn (M.Sc. student 2014-2015) <p>Leiden Univ., NL</p> <ul style="list-style-type: none"> • Prof. Peter van Bodegom <p>Univ. Eastern Finland</p> <p>35. Prof. Marja Maljanen</p> <p>36. Prof. Christina Biasi</p> <ul style="list-style-type: none"> • Heli Yli-Moijala (M.Sc. student 2012-2018) <p>LSCE, Inst. Pierre Simon Laplace, France</p> <p>37. Dr. Rose Abramoff</p>	<p>62. Prof. Ulrike Felt</p> <p>63. Virginia Vargolska (PhD student 2020...)</p> <ul style="list-style-type: none"> • Alexander Tveit (Post-doc 2018-2019) • Judith Prommer (PhD student 2017-2018) • Philipp Guendler (M.Sc. student 2018-2019) • Dr. Tom Walker (post-doc) • Dr. Anne Daebeleer (post-doc) <p>64. Prof. Michael Wagner</p> <p>65. Dr. Petra Pjevac</p> <p>66. Dr. Craig Herbold</p> <p>67. Dr. Andrew Giguere (post-doc 2019...)</p> <p>Univ. of Innsbruck - Austria</p> <p>68. Prof. Michael Bahn</p> <p>69. Kathiravan M. Meeran (PhD student 2018...)</p> <p>70. Fabrizio Protti (PhD student 2020...)</p> <ul style="list-style-type: none"> • Lena Müller (MSc student 2018) <p>VSI - Austria</p> <p>71. Dr. Liaquat Seehra</p> <p>BOKU - Austria</p> <p>72. Prof. Boris Rewald</p> <p>73. Dr. Gernot Bodner</p> <p>74. Dr. Hans Sandén</p> <p>75. Pavel Baykalov (PhD student 2020....)</p> <ul style="list-style-type: none"> • Christoph Rosinger (PhD student 2016-2018) <p>Universitat Autònoma de Barcelona (UAB), Spain</p> <p>76. Prof. Josep Peñuelas</p> <p>77. Dr. Jordi Sardans</p> <p>78. Dr. Iolanda Filella</p> <p>79. Dr. Olga Margalef</p> <p>80. Dr. Albert Gargallo (post-doc 2016...)</p> <p>81. Dr. Sara Marañón Jiménez (Post-doc 2017...)</p> <p>82. Dr. Guille Peguero (Post-doc 2018...)</p> <p>83. Argus Pesqueda (PhD student 2020...)</p> <ul style="list-style-type: none"> • Dr. Mireia Bartrons (post-doc 2016-2019) • Daijun Liu (Post-doc 2018-2019) • Miriam Raluy (M.Sc. student 2018) • Marta Ayala Roque (M.Sc. student 2016) <p>Bertley Lab - USA</p> <p>84. Dr. Margaret S. Torn</p> <p>85. Dr. Jennifer Soong (Post-doc)</p> <p>In total active in 2020:</p> <p>53 researchers, 7 postdocs and 22 PhD students and 3 MSc/BSc students</p> <p>32 universities/institutes</p> <p>16 countries</p>
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2. ForHot's main happenings Mar 2019 – July 2020

- 12-14 March. Meeting in Sitges
- 15 March Kick-off Future Arctic (Starts 1 June)
- April. Palli, Maria Svarvarsdottir, Bernard Gill, BOKU, were field technicians. NDVI, Theta-probe, SoilT
- May. Antonia Lindau, BOKU. Treerings FN.
- June. Niel worked on TNT
- Aug. Niel and Katir worked on TNT (deep collars for autotroph. and heterotrophic resp in GN, GO and TNT)
- Aug. Andrew Guguere (Vienna) GO1-4A, D, E, F samples for nitrification active., GHG prod., NH4ox archaea and bact in the lab in Vienna.
- Ivika, Biblapi, Erik V. and XXXX came and installed mini-rhyzotrons and ingrowth-cores + PRS probes.

2020

- April. Palli, Björk Kristjánsdóttir field technicians. NDVI, Thetaprobe, SoilT. Fertilization NT/TNT.
- 22-27 June. Ivika, Biblapi, Argus: Ingrowth cores/mini-rhyzotr.
- 22-23 June. Amir and Ruth arrive.
- 29 June. Linsey arrives (4 x automated gas exch systems)
- 30 June – 1 July: ForHot Meeting.

3. Project outputs

Papers already out:

1. **JOURNAL PAPER:** O’Gorman et al. (2014) Climate change and geothermal ecosystems: natural laboratories, sentinel systems, and future refugia. *Global Change Biology*, 20(11):3291-3299.
2. **JOURNAL PAPER:** Bjarni D. Sigurdsson et al. (2016). Geothermal ecosystems as natural climate change experiments: the ForHot research site in Iceland as a case study. *Icelandic Agricultural Sciences* 29:53-71.
3. **JOURNAL PAPER:** Christopher Poeplau et al. (2017). Sensitivity of soil carbon fractions and their specific stabilisation mechanisms to extreme soil warming in a subarctic grassland. *Global Change Biology* 23: 1316-1327.
4. **JOURNAL PAPER:** Niki Leblans et al. (2017). Phenological responses of Icelandic subarctic grasslands to short-term and long-term natural soil warming. *Global Change Biology* 23(11), 4932-4945.
5. **JOURNAL PAPER:** Marja Maljanen et al. (2017). The emissions of N2O and CH4 from natural soil temperature gradients in a volcanic area in southwest Iceland. *Soil Biology and Biochemistry* 109: 70-80.
6. **JOURNAL PAPER:** Albert Gargallo-Garriga. (2017). Impact of soil warming on the plant metabolome of Icelandic grasslands. *Metabolites* 7(3) 44

7. **JOURNAL PAPER:** Martin Holmstrup et al. (2018). Resilience in functional diversity of Collembola subjected to long-term warming. *Functional Ecology* 32(5): 1304-1316
8. **JOURNAL PAPER:** Dajana Radujkovic et al. (2018). Prolonged exposure does not increase soil microbial community response to warming along geothermal gradients. *FEMS Microbiology Ecology* 94(2): fix174.
9. **JOURNAL PAPER:** Marja Maljanen et al. (2018). The potential effect of elevated soil temperatures on the production of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), nitric oxide (NO) and nitrous acid (HONO) from volcanic soils in southern *Iceland*. *Icelandic Agricultural Sciences* 31, 11-22
10. **JOURNAL PAPER:** Tom W. N. Walker, Christina Kaiser, Florian Strasser, Niki I. W. Leblans, Dagmar Woebken, Ivan A. Janssens, Bjarni D. Sigurdsson & Andreas Richter (2018). Microbial temperature sensitivity and biomass change explain soil carbon loss with warming. *Nature Climate Change* 8: 885-889.
11. **JOURNAL PAPER:** Christopher Poeplau, Pierre Barre, Lauric Cecillion, Francois Baudin, Bjarni D. Sigurdsson (2019). Changes in the Rock-Eval signature of soil organic carbon upon extreme soil warming and chemical oxidation - A comparison. *Geoderma* 337 (2019): 181-190.
12. **JOURNAL PAPER:** Sara Vicca, Benjamin D. Stocker, Sasha Reed, William R. Wieder, Michaela Bahn, Philip A. Fay, Ivan A Janssens, Hans Lambers, Josep Peñuelas, Shilong Piao, Karin T Rebel, Jordi Sardans, Bjarni D. Sigurdsson, Kevin Van Sundert, Ying-Ping Wang, Sönke Zaehle, Philippe Ciais (2018). Using research networks to create the comprehensive datasets needed to assess nutrient availability as a key determinant of terrestrial carbon cycling. *Environmental Research Letters* 13(12): 125006.
13. **JOURNAL PAPER:** Marañón-Jiménez S., Soong J.L., Leblans N.I.W., Sigurdsson B.D., Peñuelas J., Richter, A., Asensio D., Fransen E., Janssens I.A. (2018). Geothermally warmed soils reveal persistent increases in the respiratory costs of soil microbes contributing to substantial C losses. *Biogeochemistry* 138: 245–260.
14. **JOURNAL PAPER:** Kaarin Parts, Leho Tedersoo, Andreas Schindlbacher, Bjarni D. Sigurdsson, Niki Leblans, Edda Oddsdottir, Werner Borken, Ivika Ostonen (2019) Acclimation of fine root systems to soil warming: comparison of an experimental setup and a natural soil temperature gradient. *Ecosystems* 22(3): 457-472.
15. **JOURNAL PAPER:** Nicholas Rosenstock, Magnus Ellström, Edda Oddsdottir, Bjarni D Sigurdsson & Håkan Wallander (2019). Carbon sequestration and community composition of ectomycorrhizal fungi across a geothermal warming gradient in an Icelandic spruce forest. *Fungal Ecology* 40: 32-42.
16. **JOURNAL PAPER:** Tom W. N. Walker, et al. (2019). A systemic decadal-scale overreaction to soil warming in a grassland ecosystem. *Nature Ecology and Evolution* 4: 101-108
17. **JOURNAL PAPER:** Sara Marañón-Jiménez, et al. (2019). Coupled carbon and nitrogen losses in response to seven years of chronic warming in subarctic soils. *Soil Biology and Biochemistry* 134: 152-161.

18. **JOURNAL PAPER:** Cindy De Jonge, et al. (2019) Lipid biomarker temperature proxy responds to abrupt shift in the bacterial community composition in geothermally heated soils. *Organic Geochemistry*, 137, 103897. doi:<https://doi.org/10.1016/j.orggeochem.2019.07.006>
19. **JOURNAL PAPER:** Dmitry Kutcherov, et al. (2020). Temperature responses in a subarctic springtail from two geothermally warmed habitats. *Pedobiologia - Journal of Soil Ecology* 78: 150606. <https://doi.org/10.1016/j.pedobi.2019.150606>
20. **JOURNAL PAPER:** Johan De Gruyter, et al. (2020) Patterns of local, intercontinental and inter-seasonal variation of soil bacterial and eukaryotic microbial communities. *FEMS Microbiology Ecology* 96, fiae018.
21. **JOURNAL PAPER:** Jing Zhang et al. (2020). The influence of soil warming on organic carbon sequestration of arbuscular mycorrhizal fungi in a sub-Arctic grassland. *Soil Biology and Biochemistry* 147(August 2020): 107826
22. **JOURNAL PAPER:** Christopher Poeplau et al. (2020). Strong warming of a subarctic Andosol depleted soil carbon and aggregation under forest and grassland cover. *Soil* 6, 115–129. <https://doi.org/10.5194/soil-6-115-2020>

PhD theses 2019-2020:

1. Jing Zhang – Lund Univ. / X in China. Autumn 2019.
2. Chao Fang – Univ. Antwerp / X in China. May 2020.
3. Kaarin Parts – Tartu Univ., Estonia. June 2020.

MSc thesis 2019-2020:

1. Rán Finnsdóttir – Uppsala Univ. May 2020.

For more, see www.forhot.is/publications

Publication plans 2020-2021



We have had a good year publication-wise! We now have 22 papers that give data from the ForHot sites, whereof 7 appeared since the ForHot meeting in 2019 (see above) and 2 have been submitted (see below). Three ForHot-related PhD theses were defended since last meeting.

The following papers have been submitted or are just to be re-submitted and should appear soon:

1. **JOURNAL PAPER:** Marja Maljanen, Christina Biasi et al. Geothermal sources of ^{13}C CO_2 fluxes from FN. (in press).
2. **JOURNAL PAPER:** Albert Gargallo et al. The next metabolomics paper - GN GO soil from 2015 (in press).
3. **JOURNAL PAPER:** Chao Fang et al. Fine-root turnover in GN, GO and NT (in preb.)
4. **JOURNAL PAPER:** Andrea Söllinger et al. MetaTranscriptome data from GN/GO on functional diversity (in preb)
5. **JOURNAL PAPER:** Niel Verbrigghe, Niki Leblans et al. 2013 and 2018 GN and GO SOC-changes (in preb).

The participants at the 2019 meeting had pledged to submit and publish the following papers – the deadline for those has now been extended to the 2021 meeting Those on the list below list that will not have done so, promised that at the next meeting (2021) they would bring a bottle of wine and give to another person on the list who had succeeded to keep his/her promise.

6. **James Weedon & Erland Bååth** The soil bacteria growth and composition at FN/GN in 2012 (was presented)
7. **Páll Sigurdsson et al.** Fine-root turnover in FN (was presented)
8. **Páll Sigurdsson et al.** Aboveground and belowground phenology in FN
9. **Páll Sigurdsson et al.** Tree growth and forest productivity in FN
10. **Páll Sigurdsson et al.** C-balance changes in FN during 2013-2018
11. **Per Gundersen et al** Leachates in FN, GN, and GO 2015-2018 (was presented)
12. **Krassimira et al.** Nematodes in FN, GN and GO in 2014 (was presented)
13. **Niki Leblans, Ivan Janssens et al.** Effect of short- and long-term soil warming on plant and soil stoichiometry in GN and GO
14. **Martin Maddison et al.** N_2 , NO_x , CH_4 , N_2O , CO_2 incubations from GN, GO and FN
15. **Jordi Sardans et al.** SEM of GN and GO
16. **Niel Verbrigghe et al.** First paper from TNT

17. **Jenny Soong/Niel Verbrigge + Wallander, Poeplau & Richter et al.** Fractionations of GN/GO soil with different methods.
18. **Kathiravan M. Meeran et al.** Pulse-labelling study 2018 in TNT – a
19. **Kathiravan M. Meeran et al.** Pulse-labelling study 2018 in TNT – b
20. **Matthilde Dahl et al.** MetaTranscriptnome data from GN/GO on functional diversity (presented)
21. **Sara Marañón Jiménez et al.** N-cycle from Seasonal Experiment in GN/NT
22. **Sara Marañón Jiménez et al.** N-cycle from Seasonal Experiment in GN/NT
23. **Joana da Silva et al.** Org-N cycl MetaTranscriptnome data form GN/GO
24. **Bjarni D. Sigurdsson et al.** Effects of Land Use Change synthesis paper
25. **Philipp Guendler et al.** Seasonal Experiment I
26. **Andreas Richter et al.** Seasonal experiment
27. **Tom Walker, Erik V et al.** Synthesis on plant and soil community changes due to warming
28. **Ivika Ostonen, James Weedon, et al.** FN synthesis paper
29. **Ruud Ts** Threshold in microbial community compositions in different soils
30. **Hans Sandén et al.** (2018/2019) FN enz responses
31. **Bryndís Marteinsdottir, Nia Perron, et al.** (2017). Plant phenology and fitness at Hengill, GN and GO
32. **Erland Bååth & Liu.** The fungi PFLAs, OM spectroscopy and enzymatic responses in GN and GO
33. **Lucia Fuchslueger et al.** Decomposition results from TNT
34. **Guille Peguero et al.** Soil invertebrates and environmental DNA from GN/GO
35. **Daijun Liu et al.** Multi-functionality synthesis paper from GN/GO/FN
36. **Josep Peñuelas & Jordi Sardans.** Biogeochemical Nitch Shifts in ForHot
37. **Oh Mann** Carbon chickien & N eggs

Synthesis activities 2020-2021

The ForHot business meeting 2020 formally endorsed the following synthesis activities.

1. Jordi Sardans suggested synthesis (see talk)
2. Tom Walker's and Erik's suggested synthesis (see above)
3. Josep suggested synthesis paper on the metagenomics, metatranscriptomics and metabolomics of soil data.
4. Synthesis paper on N losses to be started this autumn. Sara M is leading.

Andi asks authors to wait at least to the autumn before starting; because there is a lot of “organismic” data not yet included in the database from the seasonal experiment etc.

Bjarni also reminds that we really need to enter ForHot data into the upcoming database structure hosted by IMEC/Univ.Antw. The ForHot database now is not up to date after 2016...

4. New members

No applications were pending for new ForHot members.

5. Funding news

- Ivika got a grant from Estonia to continue her ForHot activities for 2020-2024.
- Bjarni just got an infrastructure grant from the Icel. Res. Council to buy equipment for ESR7 and ESR10 PhD projects.
- Mathilde Dahl got a post-doc grant to make a new study on seasonal dynamics of metatranscriptomics in GO.
- Alex and Andrea are going to submit a grant proposal to add to Mathilde's new seasonal experiment. More microcosm studies + pure cell-culture studies...
- Andi, Erik V and Tina plan to submit a grant proposal to FWO/Austria to continue with microbial ecology research.
- Ivan plans to write a ForHot-related grant proposal to continue Antwerp's involvement in new activities.
- Sara M. will apply for a Spanish grant for starting a transplant experiment.

6. ForHot / FutureArctic database issues

It was agreed that it was the highest priority to get the new database structure at IMEC/Univ. Antwerp so the ForHot database can be updated with 2018-2020 data (and older data that is still missing).

7. Other issues

- **Upcoming meetings**
 - a) **Sept/Oct 2020, Vienna and/or on-line.**
 - a. **Seasonal Experiment I:** Andi will organize a workshop on the analysis and data from the "seasonal experiment" for those who are involved in that activity.
 - b. **Seasonal Experiment II:** There was a suggestion to add to this meeting a session on a new "seasonal experiment"; in connection with Mathilde's project plan – and which hypothesis we should/could address there.
 - b) **Oct 6-9 2020, Iceland, FA PhD course.**
 - a. The 1 ECTS fieldcourse part of the FutureArctic PhD course will take place at the ForHot fieldsite during 7-8 Oct. Many PIs will be involved there with the training.
 - b. Many ESRs/PIs are linking their field campaigns to this meeting.
 - c) **April 2021 in Tartu, Estonia and on-line? Next general ForHot meeting.**

- a. We made a mistake; so the Antwerp in connection with the PhD course there in **February 2022**, not in 2021. It will therefore become ForHot 2022.
- b. There is a new suggestion that we instead will have ForHot 2021 in **Tartu, Estonia**, after Easter in **early-mid April 2021**. Ivika Ostonen would be the local organizer. This will be discussed among PIs and decided soon.

- **The TNT experiment**

- What to do now with the infrastructure when the TNT experiment is ending. Decided that Bjarni's team will be hired to continue fertilizing the plots for at least ca. 3 years more and maintain the markings, etc.

- **Heterogeneity** among the GN (and GO) plots. How can this problem be reduced? No simple solutions – but this issue was discussed. Summary:

- Map the experimental areas better in terms of “all” variability. It is a totally unmanaged system with a lot of micro-topography, patchy vegetation and other conditions. Not realistic to be able to get this spatial variability under full control by mapping.
- Make composite samples for each “level”/“plot” within transects when allowed ((**most comparable data along a transect, within a study**)). VS. Use the dedicated 50x50 cm “Intensive sampling plots” which are found close to all permanent study plots (so most groups sample from the same micro-spatial area). ((**most comparable data between studies**))
- Be careful to georeference all samples you take; so later they can be paired spatially. The small scale of the study requires then a more accurate georeferencing than can be done by a normal gps unit or a mobile phone.

- **Root morphology.** Does anybody have frozen or dried root samples from the grasslands? Ivika would be very thankful if such samples from earlier campaigns could be shared with her.

8. The 2020 mini-conference on recent findings in ForHot

This was **Session 1**. Pdfs from (almost) all the talks is available on a closed dropbox folder (the address is <https://www.dropbox.com/sh/xjlq7bzuxhsxuyn/AADN0t-b6Ck9J39wo03InsxKa?dl=0>)

Talk 01. **Bjarni D. Sigurdsson**: ForHot and FutureArctic research status: a VERY quick overview.

Theme: “*Let’s peak into tomorrow’s sessions*”. Chair: **Ivika Ostonen**

Talk 02: **Christopher Poeplau**: *Fractionating organic matter - soil structure changes following loss of SOM* (to be continued in Session 2)

Talk 03: **Andreas Richter**: *The metatranscriptome project* (to be continued in Session 3)

Talk 04. **Michael Bahn**: *The TNT project* (to be continued in Session 4)

Theme: “*Main experimental activities overview*”. Chair: **Lucia Fuchslueger**

Talk 05. **Andreas Richter**: *The seasonal experiment: what now?* .

Talk 06. **Sara Marañón Jiménez**: *Last incoming results from the seasonal 15N labeling experiment and emerging ideas for the soil N losses*.

Talk 07. **Gargallo-Garriga A**, Marañón S, Pesqueda A, Sardans J, Penuelas J. *Shifting metabolomes of Forhot soils and plants in response to short and long-term warming and fertilization*.

Talk 08. **Jordi Sardans**, Gargallo-garriga A, Marañón S, Pesqueda A, Penuelas J. On multivariate Bayesian analyses of the trends of adaptation of Forhot grasslands to warming.

Talk 09. **Páll Sigurdsson**: *The FN spruces’ fine root growth and turnover*

Talk 10. **Rán Finnsdóttir**: Sheep herbivory in a warming climate: A lawnmower in sheep’s clothing or a helpful gardener? Effects of geothermal soil warming and sheep herbivory on a grassland community in Iceland.

Theme: “*Let’s peak into the Future Arctic future*”. Chair: **Ivan Janssens**

Talk 11: **Ivan Janssens**. Future Arctic project plan 2020-2023 recap.

Talk 12. **Ruth P. Tchana Wandji**: *NDVI and other regular background measurements in 2019-2020*.

Talk 13. **Biplabi Bhattarai**: *Dynamics of root and rhizomes in the warming grasslands*.

Talk 14: **Fabrizio Protti**: *Diel, synoptic and seasonal variability in sources of soil CO2 emissions*.

Talk 15. **Linsey Marie Avila**: *High temporal resolution measurements of CO2, CH4 and N2O in using automated light-dark chambers*.

Talk 16. **Priyesh Pappinisseri Puluckul**: *Towards an ecosystem of connected things: plans, action & goals!*

Theme: “*Superhero session*”. Chair: **Bryndis Marteinsdottir**

Talk 17: **Rose Abramoff**: Modelling some breakthrough findings of ForHot and FutureArctic.

Talk 18. **Niel Verbrügge** *A window on the future: a short-term incubation of long-term warmed soils*. (Talk that was intended for tomorrow’s Session 4 = TNT experiment).

Theme: *“The best was kept until last”*. Chair: **Bjarni D. Sigurdsson**

Talk 21: **Jennifer Soong**: Five years of whole-soil warming led to loss of subsoil carbon stocks and increased CO₂ efflux in a coniferous forest.

Three sessions were also organized on-line – and those talks are also found on the Dropbox folder.

Session 2. Fractionating organic matter - soil structure changes following loss of SOM.

This session was really focusing on the soil aggregates and how their amounts and chemical composition changed with warming. Talks were given by Niel and Moritz. The teaser to the session was given by Christopher Poeplau. What started out as a loss of “protection” by aggregate brake-down, as hypnotized in Christopher’s first ForHot paper, is now changing into more complex story; as it is apparent that the chemical composition inside the aggregates is also greatly affected by the warming... We need to revise our hypotheses on SOM protection and stability.

Talk 19: **Niel Verbrigghe**: *Carbon and nitrogen pools in soil aggregates from GO and GN separated by wet sieving*

Talk 20: **Moritz Mohrlök**: *Response of physical soil fractions in GO and GN to increased temperature*

Session 3. The metatranscriptome activity.

Talks were given by Tim, Andrea, Joana, Craig, Alex and Mathilde. The teaser was given by Andi.



Alex Andrea Craig Joana Mathilde Tim

VERY cool data!! One of the emerging trends with warming is that smaller-bodied organisms, and possibly smaller microbial cells are favored in the warmer environment. Two possible drivers:

- a) Because of change in soil structure (less porosity due to loss of SOM) the „movement“ of smaller soil organisms is favored.
- b) This could also be driven by the general latitudinal trend seen towards higher (colder) latitudes in animal ecology; further north you go, the body size tends to increase. Even within species. This has been explained by a decrease in volume to mass ratio leads to more efficient energy utilization in a cold environment.

Many other exciting aspects were discussed!

Talk 22: **Tim Urich**. Long-term warming affects soil microbial foodweb structure in sub-arctic grassland

Talk 23: **Andrea Söllinger**. Metatranscriptomics revealed multi-layered microbial responses to long-term soil warming

Talk 24: **Joana Silva**. Differential gene expression of organic N mining enzymes in response to warming in subarctic grasslands

Talk 25: **Craig Herbold**. Genome-resolved metagenomics of the ForHot site: It's about the journey, not the destination

Talk 26: **Alexander Tveit**. Microbes on a diet: Can long term warming lead to smaller microbial cells with less content?

Talk 27: **Mathilde Dahl**. New Project: Seasonal dynamics in the soil microbial food web

Session 4. The TNT experiment.

Talks were given by Kathir, Niel and Lucia on different aspects of the C-cycle in this manipulation experiment where both warming and N-availability are changed across large gradients in both. Michael Bahn gave the teaser. The results are partly quite surprising and don't fully align with the hypotheses posed; especially with the N-addition. To give few things most surprising:

- a) Surface litter decomposition did not show temperature response when N additions exceeded X.
- b) Warming without additional N did not increase July instantaneous GPP at max LAI (not summed up over time).
- c) Allocation response bypassed root growth and mainly went for mycorrhiza?/exudation?

Talk 28. **Michael Bahn**. Re-intro by **chair** and the aims of this session

Talk 29. **Kathiravan M. Meeran**: *Effect of soil warming and N availability on the fate of recent carbon in subarctic grassland*

Talk 30. **Lucia Fuchslueger**: *Effects of warming on the stabilization of plant litter derived C and N in soil*