## **Global Greenhouse Gas Reconciliation 2022**

Zhu Deng<sup>1,2,3</sup>, Philippe Ciais<sup>4,\*</sup>, Liting Hu<sup>5</sup>, Adrien Martinez<sup>4</sup>, Marielle Saunois<sup>4</sup>, Rona L. Thompson<sup>6</sup>, Kushal Tibrewal<sup>4</sup>, Wouter Peters<sup>7,8</sup>, Brendan Byrne<sup>9</sup>, Giacomo Grassi<sup>10</sup>, Paul I. Palmer<sup>11,12</sup>, Ingrid T. Luijkx<sup>7</sup>, Zhu Liu<sup>1,2,3,\*</sup>, Junjie Liu<sup>9,13</sup>, Xuekun Fang<sup>5</sup>, Tengjiao Wang<sup>14</sup>, Hanqin Tian<sup>15</sup>, Katsumasa Tanaka<sup>4,16</sup>, Ana Bastos<sup>17</sup>, Stephen Sitch<sup>18</sup>, Benjamin Poulter<sup>19</sup>, Clément Albergel<sup>20</sup>, Aki Tsuruta<sup>21</sup>, Shamil Maksyutov<sup>16</sup>, Rajesh Janardanan<sup>16</sup>, Yosuke Niwa<sup>16,22</sup>, Bo Zheng<sup>23,24</sup>, Joël Thanwerdas<sup>25</sup>, Dmitry Belikov<sup>26</sup>, Arjo Segers<sup>27</sup>, Frédéric Chevallier<sup>4</sup>

Correspondence to: Philippe Ciais (<a href="mailto:philippe.ciais@lsce.ipsl.fr">philippe.ciais@lsce.ipsl.fr</a>); Zhu Liu (<a href="mailto:zhuliu@hku.hk">zhuliu@hku.hk</a>)

<sup>&</sup>lt;sup>1</sup>Department of Geography, University of Hong Kong, Hong Kong SAR, China

<sup>&</sup>lt;sup>2</sup>Institute for Climate and Carbon Neutrality, University of Hong Kong, Hong Kong SAR, China

<sup>&</sup>lt;sup>3</sup>Department of Earth System Science, Tsinghua Unverisity, Beijing, China

<sup>&</sup>lt;sup>4</sup>Laboratoire des Sciences du Climat et de l'Environnement, IPSL, CEA-CNRS-UVSQ, Université Paris-Saclay, Gif-sur-Yvette, France

<sup>&</sup>lt;sup>5</sup>College of Environmental & Resource Sciences, Zhejiang University, Hangzhou, Zhejiang, China

<sup>&</sup>lt;sup>6</sup>Norwegian Institute for Air Research (NILU), Kjeller, Norway

<sup>&</sup>lt;sup>7</sup>Meteorology and Air Quality Department, Wageningen University & Research, Wageningen, the Netherlands

<sup>&</sup>lt;sup>8</sup>Energy and Sustainability Research Institute Groningen, University of Groningen, Groningen, the Netherlands

<sup>&</sup>lt;sup>9</sup>Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

<sup>&</sup>lt;sup>10</sup>Joint Research Centre, European Commission, Ispra (VA), Italy

<sup>&</sup>lt;sup>11</sup>National Centre for Earth Observation, University of Edinburgh, Edinburgh, UK

<sup>&</sup>lt;sup>12</sup>School of GeoSciences, University of Edinburgh, Edinburgh, UK

<sup>&</sup>lt;sup>13</sup>Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA, USA

<sup>&</sup>lt;sup>14</sup>Institute of Blue and Green Development, Shandong University, Weihai, China

<sup>&</sup>lt;sup>15</sup>International Center for Climate and Global Change Research, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849, USA

<sup>&</sup>lt;sup>16</sup>Earth System Division, National Institute for Environmental Studies, Onogawa 16-2, Tsukuba, Ibaraki 305-8506, Japan

<sup>&</sup>lt;sup>17</sup>Department of Biogeochemical Integration, Max Planck Institute for Biogeochemistry, Hans Knöll Str. 10, Jena, Germany

<sup>&</sup>lt;sup>18</sup>Faculty of Environment, Science and Economy, University of Exeter, Exeter, UK

<sup>&</sup>lt;sup>19</sup>NASA Goddard Space Flight Center, Biospheric Sciences Laboratory, Greenbelt, MD 20771, USA

<sup>&</sup>lt;sup>20</sup>European Space Agency Climate Office, ECSAT, Harwell Campus, Didcot, Oxfordshire, UK

<sup>&</sup>lt;sup>21</sup>Finnish Meteorological Institute, P.O. Box 503, 00101, Helsinki, Finland

<sup>&</sup>lt;sup>22</sup>Department of Climate and Geochemistry Research, Meteorological Research Institute (MRI), Nagamine 1-1, Tsukuba, Ibaraki 305-0052, Japan

<sup>&</sup>lt;sup>23</sup>Shenzhen Key Laboratory of Ecological Remediation and Carbon Sequestration, Institute of Environment and Ecology, Tsinghua Shenzhen International Graduate School, Tsinghua University, Shenzhen, 518055, China

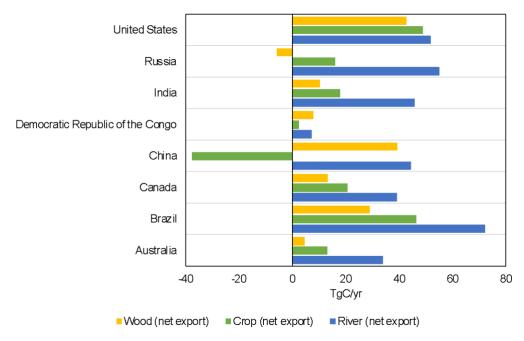
<sup>&</sup>lt;sup>24</sup>State Environmental Protection Key Laboratory of Sources and Control of Air Pollution Complex, Beijing 100084, China

<sup>&</sup>lt;sup>25</sup>Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

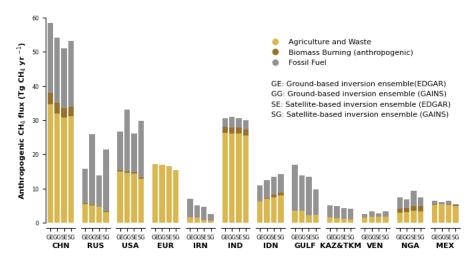
<sup>&</sup>lt;sup>26</sup>Center for Environmental Remote Sensing, Chiba University, Chiba, Japan

<sup>&</sup>lt;sup>27</sup>TNO, Department of Air quality and Emissions Research, P.O. Box 80015, NL-3508-TA, Utrecht, the Netherland

## **Supplementary Information**



SI Fig 1. National annual lateral CO<sub>2</sub> flux from wood (yellow bars) and crop (green bars) trade and from river transportation (blue bars) from selected countries.



SI Fig 2. Annual average of anthropogenic CH4 emissions from in-situ and satellite inversions based on two different priors during the period of 2010-2020. GE and SE denote the anthropogenic CH4 flux from the in-situ and satellite inversion ensembles based on EDGARv6.0 as the prior, while GG and SG represent the in-situ and satellite CH4 inversions based on GAINS as the prior.