

References

- [1] T. Alazard and J.-M. Delort, Global solutions and asymptotic behavior for two-dimensional gravity water waves. *Ann. Sci. Éc. Norm. Supér. (4)* **48** (2015), 1149–1238
- [2] S. Alinhac, *Blowup for nonlinear hyperbolic equations*. Progr. Nonlinear Differential Equations Appl. 17, Birkhäuser, Boston, 1995
- [3] D. Bambusi and S. Cuccagna, On dispersion of small energy solutions to the nonlinear Klein Gordon equation with a potential. *Amer. J. Math.* **133** (2011), 1421–1468
- [4] F. Bethuel, P. Gravejat and D. Smets, Asymptotic stability in the energy space for dark solitons of the Gross–Pitaevskii equation. *Ann. Sci. Éc. Norm. Supér. (4)* **48** (2015), 1327–1381
- [5] V. S. Buslaev and G. S. Perelman, On nonlinear scattering of states which are close to a soliton. In *Méthodes semi-classiques, Vol. 2 (Nantes, 1991)*, pp. 49–63, Société Mathématique de France, Paris, 1992
- [6] V. S. Buslaev and G. S. Perelman, Scattering for the nonlinear Schrödinger equation: States close to a soliton. *St. Petersbg. Math. J.* **4** (1992), 63–102
- [7] V. S. Buslaev and G. S. Perelman, On the stability of solitary waves for nonlinear Schrödinger equations. In *Nonlinear evolution equations*, pp. 75–98, Amer. Math. Soc. Transl. Ser. 2 164, American Mathematical Society, Providence, 1995
- [8] V. S. Buslaev and C. Sulem, On asymptotic stability of solitary waves for nonlinear Schrödinger equations. *Ann. Inst. H. Poincaré Anal. Non Linéaire* **20** (2003), 419–475
- [9] A.-P. Calderón and R. Vaillancourt, On the boundedness of pseudo-differential operators. *J. Math. Soc. Japan* **23** (1971), 374–378
- [10] G. Chen, J. Liu and L. Bingyin, Long time asymptotics and stability for the sine-Gordon equation, 2020, arXiv:[2009.04260](https://arxiv.org/abs/2009.04260)
- [11] D. Christodoulou and S. Klainerman, *The global nonlinear stability of the Minkowski space*. Princeton Math. Ser. 41, Princeton University Press, Princeton, 1993
- [12] H. O. Cordes, On compactness of commutators of multiplications and convolutions, and boundedness of pseudodifferential operators. *J. Funct. Anal.* **18** (1975), 115–131
- [13] S. Cuccagna, On asymptotic stability in 3D of kinks for the ϕ^4 model. *Trans. Amer. Math. Soc.* **360** (2008), 2581–2614
- [14] S. Cuccagna, V. Georgiev and N. Visciglia, Decay and scattering of small solutions of pure power NLS in \mathbb{R} with $p > 3$ and with a potential. *Comm. Pure Appl. Math.* **67** (2014), 957–981
- [15] S. Cuccagna and R. Jenkins, On the asymptotic stability of N -soliton solutions of the defocusing nonlinear Schrödinger equation. *Comm. Math. Phys.* **343** (2016), 921–969
- [16] S. Cuccagna and D. E. Pelinovsky, The asymptotic stability of solitons in the cubic NLS equation on the line. *Appl. Anal.* **93** (2014), 791–822
- [17] P. Deift and E. Trubowitz, Inverse scattering on the line. *Comm. Pure Appl. Math.* **32** (1979), 121–251

- [18] J.-M. Delort, Existence globale et comportement asymptotique pour l'équation de Klein-Gordon quasi linéaire à données petites en dimension 1. *Ann. Sci. Éc. Norm. Supér. (4)* **34** (2001), 1–61
- [19] J.-M. Delort, Erratum: “Existence globale et comportement asymptotique pour l'équation de Klein–Gordon quasi linéaire à données petites en dimension 1” [Ann. Sci. Éc. Norm. Supér. (4) **34** (2001), 1–61]. *Ann. Sci. Éc. Norm. Supér. (4)* **39** (2006), 335–345
- [20] J.-M. Delort, Semiclassical microlocal normal forms and global solutions of modified one-dimensional KG equations. *Ann. Inst. Fourier (Grenoble)* **66** (2016), 1451–1528
- [21] Y. Deng, A. D. Ionescu, B. Pausader and F. Pusateri, Global solutions of the gravity-capillary water-wave system in three dimensions. *Acta Math.* **219** (2017), 213–402
- [22] Y. Deng and F. Pusateri, On the global behavior of weak null quasilinear wave equations. *Comm. Pure Appl. Math.* **73** (2020), 1035–1099
- [23] J. Dereziński and C. Gérard, *Scattering theory of classical and quantum N-particle systems*. Texts Monogr. Phys., Springer, Berlin, 1997
- [24] M. Dimassi and J. Sjöstrand, *Spectral asymptotics in the semi-classical limit*. London Math. Soc. Lecture Note Ser. 268, Cambridge University Press, Cambridge, 1999
- [25] Z. Gang and I. M. Sigal, Asymptotic stability of nonlinear Schrödinger equations with potential. *Rev. Math. Phys.* **17** (2005), 1143–1207
- [26] Z. Gang and I. M. Sigal, On soliton dynamics in nonlinear Schrödinger equations. *Geom. Funct. Anal.* **16** (2006), 1377–1390
- [27] Z. Gang and I. M. Sigal, Relaxation of solitons in nonlinear Schrödinger equations with potential. *Adv. Math.* **216** (2007), 443–490
- [28] P. Germain and N. Masmoudi, Global existence for the Euler-Maxwell system. *Ann. Sci. Éc. Norm. Supér. (4)* **47** (2014), 469–503
- [29] P. Germain, N. Masmoudi and J. Shatah, Global solutions for 3D quadratic Schrödinger equations. *Int. Math. Res. Not. IMRN* **2009** (2009), 414–432
- [30] P. Germain, N. Masmoudi and J. Shatah, Global solutions for 2D quadratic Schrödinger equations. *J. Math. Pures Appl. (9)* **97** (2012), 505–543
- [31] P. Germain, N. Masmoudi and J. Shatah, Global solutions for the gravity water waves equation in dimension 3. *Ann. of Math. (2)* **175** (2012), 691–754
- [32] P. Germain, N. Masmoudi and J. Shatah, Global existence for capillary water waves. *Comm. Pure Appl. Math.* **68** (2015), 625–687
- [33] P. Germain and F. Pusateri, Quadratic Klein–Gordon equations with a potential in one dimension, 2020, arXiv:[2006.15688](https://arxiv.org/abs/2006.15688)
- [34] P. Germain, F. Pusateri and F. Rousset, Asymptotic stability of solitons for mKdV. *Adv. Math.* **299** (2016), 272–330
- [35] P. Germain, F. Pusateri and F. Rousset, The nonlinear Schrödinger equation with a potential. *Ann. Inst. H. Poincaré Anal. Non Linéaire* **35** (2018), 1477–1530
- [36] P. Gravejat and D. Smets, Asymptotic stability of the black soliton for the Gross-Pitaevskii equation. *Proc. Lond. Math. Soc. (3)* **111** (2015), 305–353

- [37] Z. Hani, B. Pausader, N. Tzvetkov and N. Visciglia, Modified scattering for the cubic Schrödinger equation on product spaces and applications. *Forum Math. Pi* **3** (2015), e4, 63
- [38] N. Hayashi and P. I. Naumkin, Asymptotics for large time of solutions to the nonlinear Schrödinger and Hartree equations. *Amer. J. Math.* **120** (1998), 369–389
- [39] N. Hayashi and P. I. Naumkin, Quadratic nonlinear Klein–Gordon equation in one dimension. *J. Math. Phys.* **53** (2012), 103711, 36
- [40] N. Hayashi and M. Tsutsumi, $L^\infty(\mathbf{R}^n)$ -decay of classical solutions for nonlinear Schrödinger equations. *Proc. Roy. Soc. Edinburgh Sect. A* **104** (1986), 309–327
- [41] D. B. Henry, J. F. Perez and W. F. Wreszinski, Stability theory for solitary-wave solutions of scalar field equations. *Comm. Math. Phys.* **85** (1982), 351–361
- [42] L. Hörmander, *Lectures on nonlinear hyperbolic differential equations*. Math. Appl. (Berlin) 26, Springer, Berlin, 1997
- [43] L. Hörmander, *The analysis of linear partial differential operators. III. Reprint of the 1994 edition*. Classics Math., Springer, Berlin, 2007
- [44] X. Hu and N. Masmoudi, Global solutions to repulsive Hookean elastodynamics. *Arch. Ration. Mech. Anal.* **223** (2017), 543–590
- [45] M. Ifrim and D. Tataru, Global bounds for the cubic nonlinear Schrödinger equation (NLS) in one space dimension. *Nonlinearity* **28** (2015), 2661–2675
- [46] S. Katayama and Y. Tsutsumi, Global existence of solutions for nonlinear Schrödinger equations in one space dimension. *Comm. Partial Differential Equations* **19** (1994), 1971–1997
- [47] J. Kato and F. Pusateri, A new proof of long-range scattering for critical nonlinear Schrödinger equations. *Differential Integral Equations* **24** (2011), 923–940
- [48] C. E. Kenig and Y. Martel, Asymptotic stability of solitons for the Benjamin–Ono equation. *Rev. Mat. Iberoam.* **25** (2009), 909–970
- [49] S. Klainerman, Global existence of small amplitude solutions to nonlinear Klein–Gordon equations in four space-time dimensions. *Comm. Pure Appl. Math.* **38** (1985), 631–641
- [50] S. Klainerman, Uniform decay estimates and the Lorentz invariance of the classical wave equation. *Comm. Pure Appl. Math.* **38** (1985), 321–332
- [51] S. Klainerman, The null condition and global existence to nonlinear wave equations. In *Nonlinear systems of partial differential equations in applied mathematics, Part 1 (Santa Fe, 1984)*, pp. 293–326, Lectures in Appl. Math. 23, American Mathematical Society, Providence, 1986
- [52] S. Klainerman and G. Ponce, Global, small amplitude solutions to nonlinear evolution equations. *Comm. Pure Appl. Math.* **36** (1983), 133–141
- [53] E. Kopylova, On long-time decay for modified Klein–Gordon equation. *Commun. Math. Anal.* (2011), 137–152
- [54] E. Kopylova and A. I. Komech, On asymptotic stability of kink for relativistic Ginzburg–Landau equations. *Arch. Ration. Mech. Anal.* **202** (2011), 213–245
- [55] E. A. Kopylova and A. I. Komech, On asymptotic stability of moving kink for relativistic Ginzburg–Landau equation. *Comm. Math. Phys.* **302** (2011), 225–252

- [56] M. Kowalczyk, Y. Martel and C. Muñoz, Kink dynamics in the ϕ^4 model: asymptotic stability for odd perturbations in the energy space. *J. Amer. Math. Soc.* **30** (2017), 769–798
- [57] M. Kowalczyk, Y. Martel, C. Muñoz and H. Van Den Bosch, A sufficient condition for asymptotic stability of kinks in general $(1+1)$ -scalar field models. *Ann. PDE* **7** (2021), Paper No. 10, 98
- [58] D. Lannes, Space time resonances [after Germain, Masmoudi, Shatah]. in: *Séminaire Bourbaki. Vol. 2011/2012. Exposés 1043–1058*, Exp. No. 1053, pp. 355–388, Société Mathématique de France, Paris, 2013
- [59] H. Lindblad, J. Lührmann, W. Schlag and A. Soffer, On modified scattering for 1-D quadratic Klein–Gordon equations with non-generic potentials. 2020, arXiv:[2012.15191](https://arxiv.org/abs/2012.15191)
- [60] H. Lindblad, J. Lührmann and A. Soffer, Asymptotics for 1D Klein–Gordon equations with variable coefficient quadratic nonlinearities. *Arch. Ration. Mech. Anal.* **241** (2021), 1459–1527
- [61] H. Lindblad, J. Lührmann and A. Soffer, Decay and asymptotics for the one-dimensional Klein–Gordon equation with variable coefficient cubic nonlinearities. *SIAM J. Math. Anal.* **52** (2020), 6379–6411
- [62] H. Lindblad and I. Rodnianski, The global stability of Minkowski space-time in harmonic gauge. *Ann. of Math. (2)* **171** (2010), 1401–1477
- [63] H. Lindblad and A. Soffer, A remark on asymptotic completeness for the critical nonlinear Klein–Gordon equation. *Lett. Math. Phys.* **73** (2005), 249–258
- [64] H. Lindblad and A. Soffer, A remark on long range scattering for the nonlinear Klein–Gordon equation. *J. Hyperbolic Differ. Equ.* **2** (2005), 77–89
- [65] H. Lindblad and A. Soffer, Scattering and small data completeness for the critical nonlinear Schrödinger equation. *Nonlinearity* **19** (2006), 345–353
- [66] H. Lindblad and A. Soffer, Scattering for the Klein–Gordon equation with quadratic and variable coefficient cubic nonlinearities. *Trans. Amer. Math. Soc.* **367** (2015), 8861–8909
- [67] Y. Martel and F. Merle, Asymptotic stability of solitons for subcritical generalized KdV equations. *Arch. Ration. Mech. Anal.* **157** (2001), 219–254
- [68] Y. Martel and F. Merle, Asymptotic stability of solitons of the subcritical gKdV equations revisited. *Nonlinearity* **18** (2005), 55–80
- [69] Y. Martel and F. Merle, Asymptotic stability of solitons of the gKdV equations with general nonlinearity. *Math. Ann.* **341** (2008), 391–427
- [70] K. Moriyama, Normal forms and global existence of solutions to a class of cubic nonlinear Klein–Gordon equations in one space dimension. *Differential Integral Equations* **10** (1997), 499–520
- [71] K. Moriyama, S. Tonegawa and Y. Tsutsumi, Almost global existence of solutions for the quadratic semilinear Klein–Gordon equation in one space dimension. *Funkcial. Ekvac.* **40** (1997), 313–333
- [72] A. F. Nikiforov and V. B. Uvarov, *Special functions of mathematical physics. A unified introduction with applications*. Birkhäuser, Basel, 1988

- [73] R. L. Pego and M. I. Weinstein, Asymptotic stability of solitary waves. *Comm. Math. Phys.* **164** (1994), 305–349
- [74] M. Schechter, *Operator methods in quantum mechanics. Reprint of the 1981 original.* Dover Publications, Mineola, 2002
- [75] J. Shatah, Global existence of small solutions to nonlinear evolution equations. *J. Differential Equations* **46** (1982), 409–425
- [76] J. Shatah, Normal forms and quadratic nonlinear Klein–Gordon equations. *Comm. Pure Appl. Math.* **38** (1985), 685–696
- [77] J. C. H. Simon and E. Taflin, Wave operators and analytic solutions for systems of nonlinear Klein–Gordon equations and of nonlinear Schrödinger equations. *Comm. Math. Phys.* **99** (1985), 541–562
- [78] A. Soffer and M. I. Weinstein, Multichannel nonlinear scattering for nonintegrable equations. *Comm. Math. Phys.* **133** (1990), 119–146
- [79] A. Soffer and M. I. Weinstein, Multichannel nonlinear scattering for nonintegrable equations. II. The case of anisotropic potentials and data. *J. Differential Equations* **98** (1992), 376–390
- [80] A. Soffer and M. I. Weinstein, Resonances, radiation damping and instability in Hamiltonian nonlinear wave equations. *Invent. Math.* **136** (1999), 9–74
- [81] J. Sterbenz, Dispersive decay for the 1D Klein–Gordon equation with variable coefficient nonlinearities. *Trans. Amer. Math. Soc.* **368** (2016), 2081–2113
- [82] A. Stingo, Global existence and asymptotics for quasi-linear one-dimensional Klein–Gordon equations with mildly decaying Cauchy data. *Bull. Soc. Math. France* **146** (2018), 155–213
- [83] T. Tao, *Nonlinear dispersive equations.* CBMS Reg. Conf. Ser. Math. 106, American Mathematical Society, Providence, 2006
- [84] X. Wang, Global infinite energy solutions for the 2D gravity water waves system. *Comm. Pure Appl. Math.* **71** (2018), 90–162
- [85] R. Weder, The $W_{k,p}$ -continuity of the Schrödinger wave operators on the line. *Comm. Math. Phys.* **208** (1999), 507–520
- [86] M. I. Weinstein, Lyapunov stability of ground states of nonlinear dispersive evolution equations. *Comm. Pure Appl. Math.* **39** (1986), 51–67